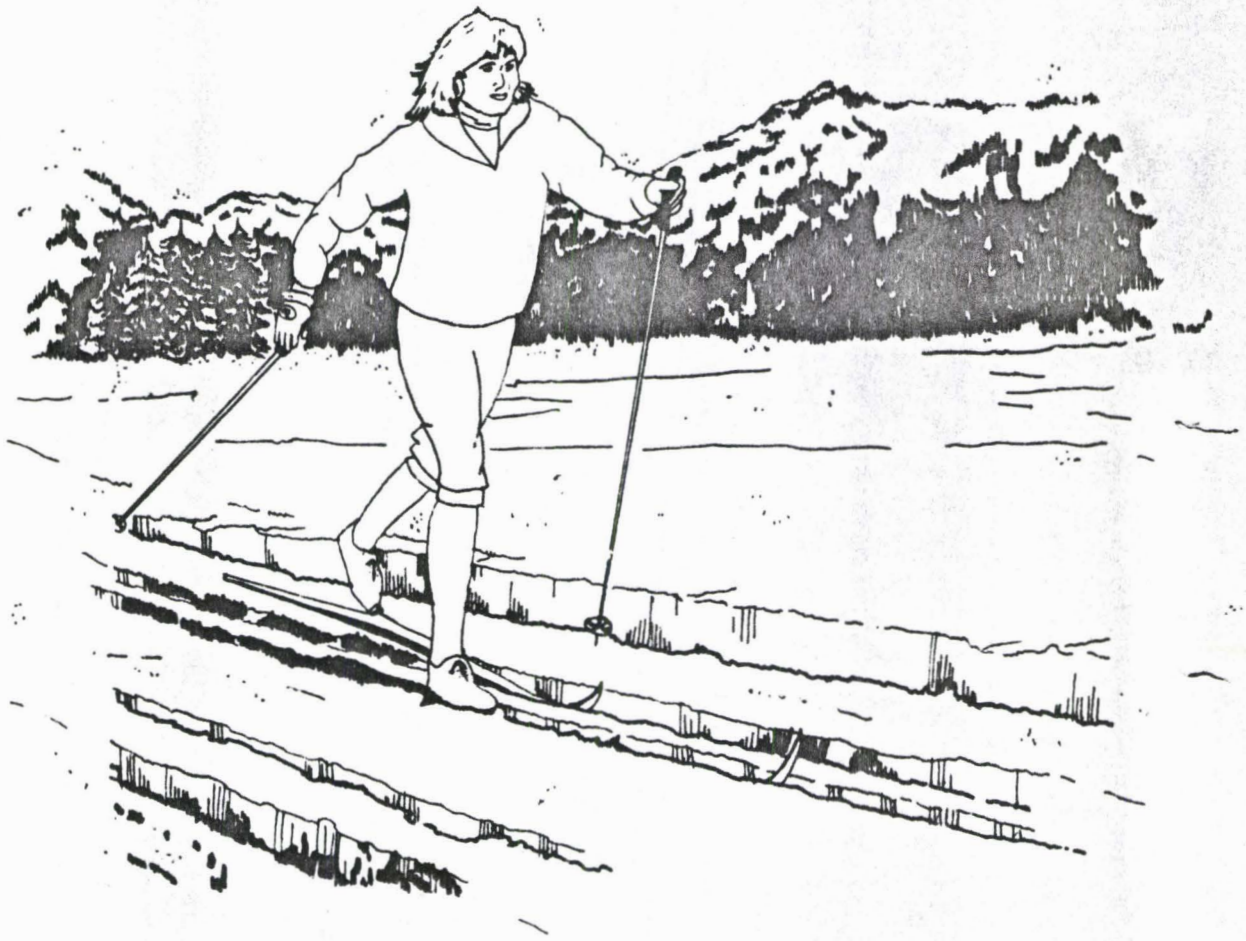
CROSS COUNTRY SKIING



AT SNOWBASIN

CROSS COUNTRY SKIING

AT

SNOWBASIN

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Professional Development for Outdoor
Recreation Management
Clemson University - 1986
Final Copy

ABSTRACT

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Title: Cross Country Skiing at Snowbasin

Abstract: The Snowbasin Area, located on the Ogden Ranger District, Wasatch-Cache National Forest, has long been recognized for its winter recreation potential. An alpine ski area was started in the 1940's and has evolved into an excellent day use ski area. Cross country skiing has become popular in recent years and a significant number of skiers use the area with few facilities developed for that use. General snowplay, i.e. sledding, tobogganirg, and tubing is also popular in this area.

The Snowbasin area has a high potential to provide cross country skiing opportunities. This is due to the rolling type topography, excellent scenic quality, and the existing paved highway access. Very little planning has been done to date for cross country skiing in this area; however, it is important to do so now for several reasons: (1) the phenomenal growth rate of cross country skiing nationwide, (2) plans by Snowbasin Ski area to develop a destination recreation resort that includes cross country skiing as a major activity, and (3) the Wasatch-Cache National Forest Land Management Plan identifies the Snowbasin area as having the highest potential on the forest to provide cross country skiing opportunities.

The overall objective of the study is to develop a cross country ski master plan for a 12,000 acre study area including as many of the different cross country skier types as

possible. The study includes the following: (1) growth and evolution of cross country skiing in the United States, (2) research on the different types of cross country skiing, (3) development of a cross country skier classification system based on experience desired, setting, and facilities/services needed, (4) development of cross country ski terrain suitability on the 12,000 acre study area using a computer system, (5) Forest Service and private enterprise role in providing skiing opportunities for the various types of skiers, and (6) development of the Snowbasin Cross Country Ski Master Plan.

ACKNOWLEDGEMENTS

I would like to offer a special thanks to the following individuals that assisted in the development of the paper:

Carolyn Harris, of the Ogden Ranger District Staff who typed and edited this paper within difficult time frames.

Beat Von Allman, winter sports planning consultant of Alpen Tech,Inc. who agreed to allow the use of his computer programs and computer system at a personal cost to himself and his firm. Beat's expertise and assistance was invaluable in the development of the master plan.

Pat Gardiner of the engineering graphics staff in the Regional Office for getting the necessary maps, developing title blocks, etc.

To my wife and family for showing great patience when I had maps and papers strewn all over the house.

I would also like to offer a special thanks to Dr. Bert Brantley and especially Dr. Gina McClellin of Clemson University for sponsoring and organizing the best training course of my career and for all the extras they did for us while at Clemson University. The course was a very enjoyable and memorable experience.

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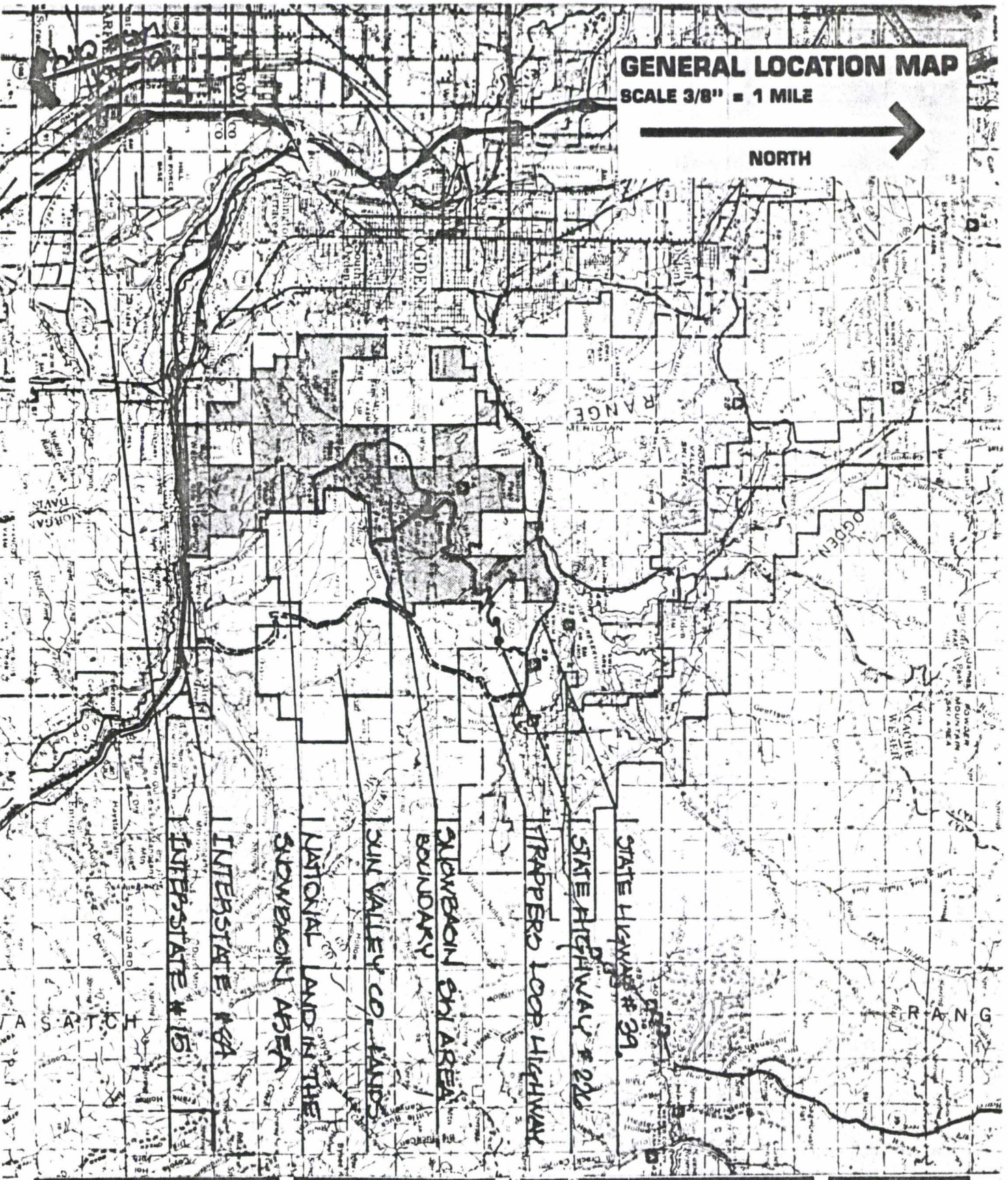
CHAPTER I

INTRODUCTION

The Snowbasin area is located on the Ogden Ranger District, Wasatch-Cache National Forest on the east side of the Wasatch Mountain Range. It is approximately three air miles east of Ogden, Utah (see Map A). Access to Snowbasin is by two lane paved highway, State Highway 226, and is 20 road miles from Ogden. Part of the Snowbasin area is comprised of the Wheeler Creek watershed which drains east and north into the Ogden River; and part of the area drains east and south and is part of the Weber River watershed. The area ranges in elevation from 5,000 to 9,800 feet.

Snowbasin is appropriately named and is comprised of a series of north and east facing bowls and drainages. Major storms come from the west and southwest across the Great Salt Lake. The storms pick up moisture, and are raised going over the Wasatch Mountains depositing a great deal of snow on the east side of the mountains. Snow depths during a normal winter will be greater than ten feet at the 9,000 foot elevation range and greater than two feet at the 5,000 foot elevation range. The north and east aspects tend to hold snow very well and significant snow depths can be expected from late November to May.

Snowbasin, because of its ease of access, outstanding scenery and amount of snow, has long been recognized for its winter recreation potential. There is a day use alpine ski area, Snowbasin Ski Area, which serves 75,000 skier visits in a normal year. Cross country skiing has become popular in recent years, although there are no developed facilities for cross country skiing. General



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A

snow play, (sledding, tobogganning, tubing, and others), is also a popular recreation activity,(see Map B).

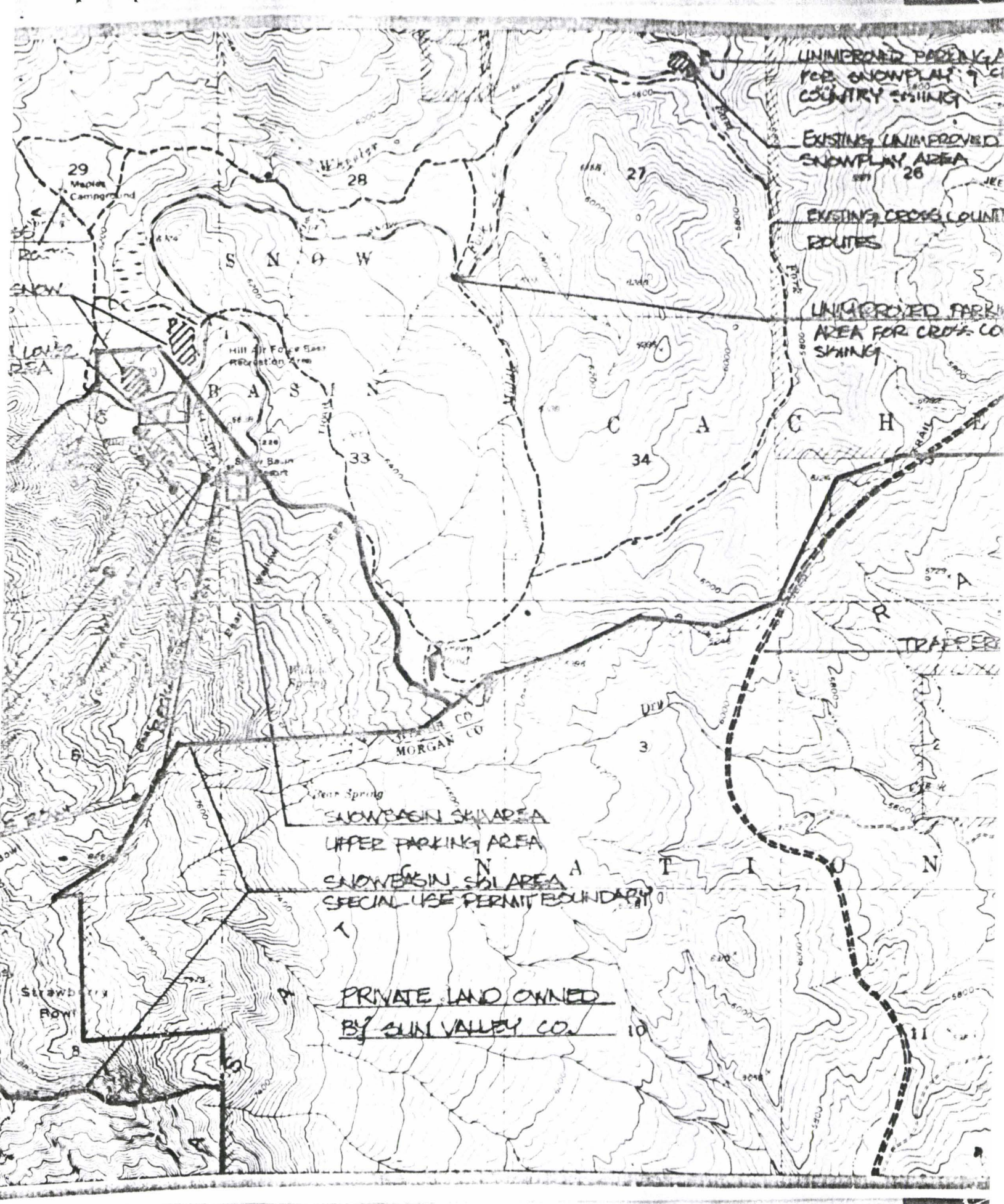
ALPINE SKIING AT SNOWBASIN

In the mid 1940's, Ogden City commissioned a nationally recognized skier named Alf Engen to study the Snowbasin area for the possible development of alpine skiing. The results of that study were positive and Snowbasin Ski Area was started. The ski area has evolved since that time, through several owners, into an excellent day use ski area.

Snowbasin Ski Area now has five chairlifts (four triple chairlifts and one double chairlift) accessing 1,750 acres of ski terrain. The majority of the terrain is in the low intermediate to high intermediate terrain. The ski area is almost entirely on National Forest Land and is operated under special use permit issued by the Wasatch-Cache National Forest (see Map B). The present capacity of Snowbasin Ski Area is 3,200 skiers at one time.

DESTINATION RECREATION RESORT PLANS AT SNOWBASIN

The present owners of Snowbasin Ski Area, Sun Valley Company, are planning an all-season destination recreation resort at Snowbasin. The resort will feature alpine skiing and cross country skiing in the winter; golf, tennis, hiking, horseback riding, and other activities in the summer. The resort plans include doubling the alpine skiing capacity to over 8,000 skiers at one time, developing a cross country ski touring center with ski trails, providing 27 holes of golf, several tennis courts, and riding/hiking trails. They also plan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FOR SNOWPLAY & C
COUNTRY SKIING
EXISTING UNIMPROVED
SNOWPLAY AREA
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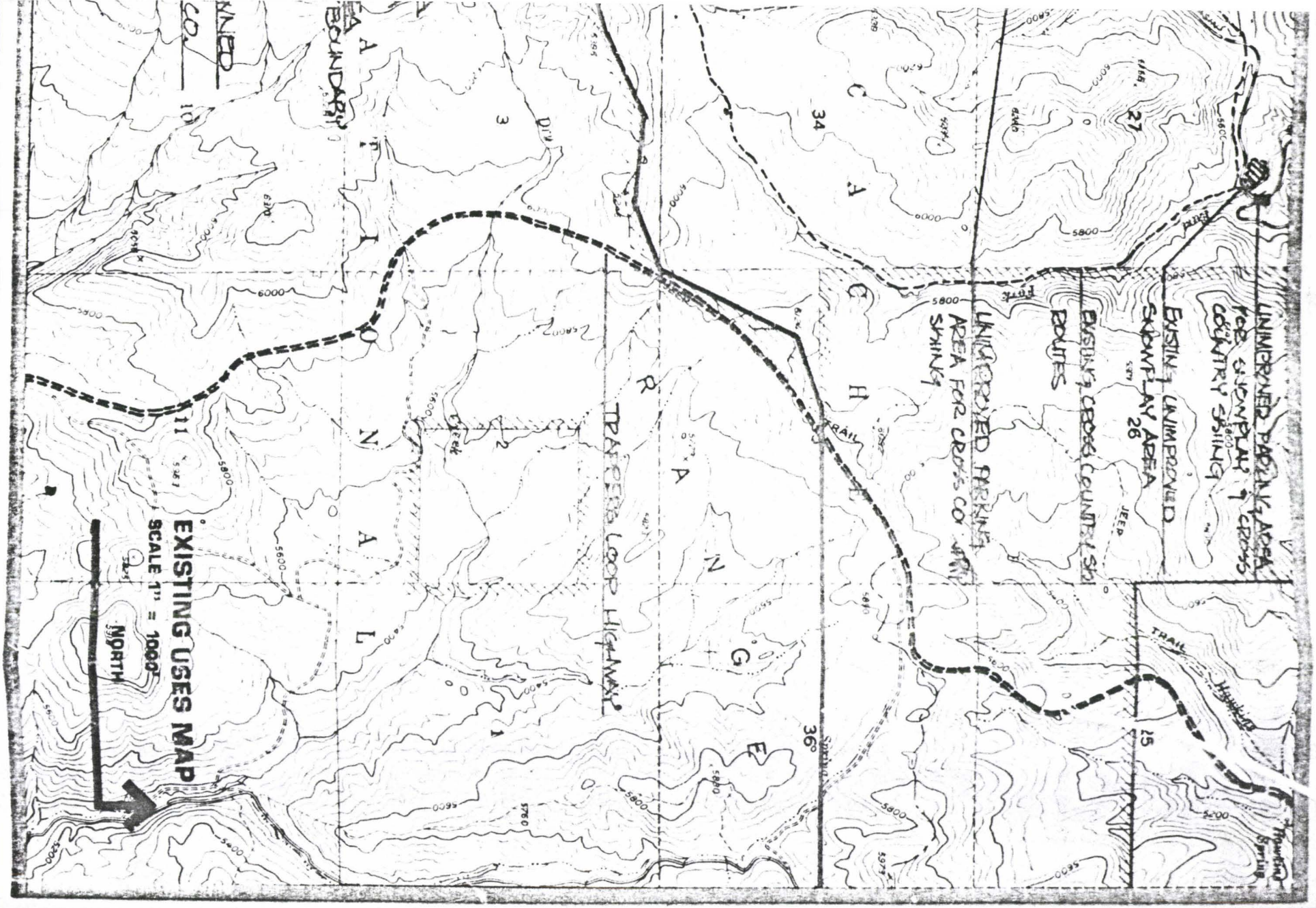
ROUTES
UNIMPROVED PARKI
AREA FOR CROSS CO
SKIING
TRAPPER
SNOWBASIN SKI AREA
UPPER PARKING AREA
SNOWBASIN SKI AREA
SPECIAL USE PERMIT BOUNDARY
PRIVATE LAND OWNED
BY SUN VALLEY CO.
29
Maples Campground
28
27
26
33
34
3
10
11
S N O W
B A S I N
C A C H E
MORGAN CO



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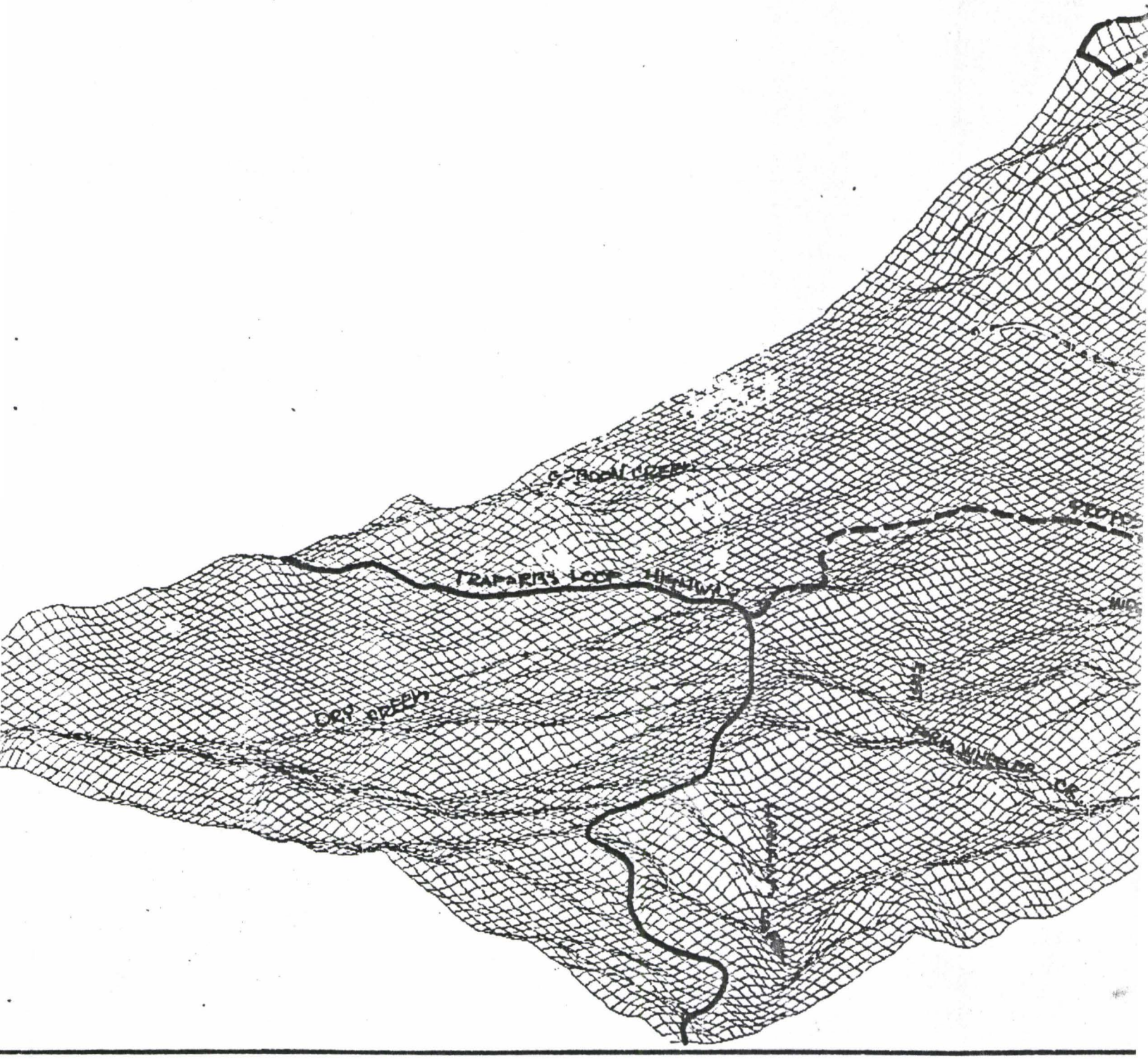
EXISTING/PROPOSED FACILITIES



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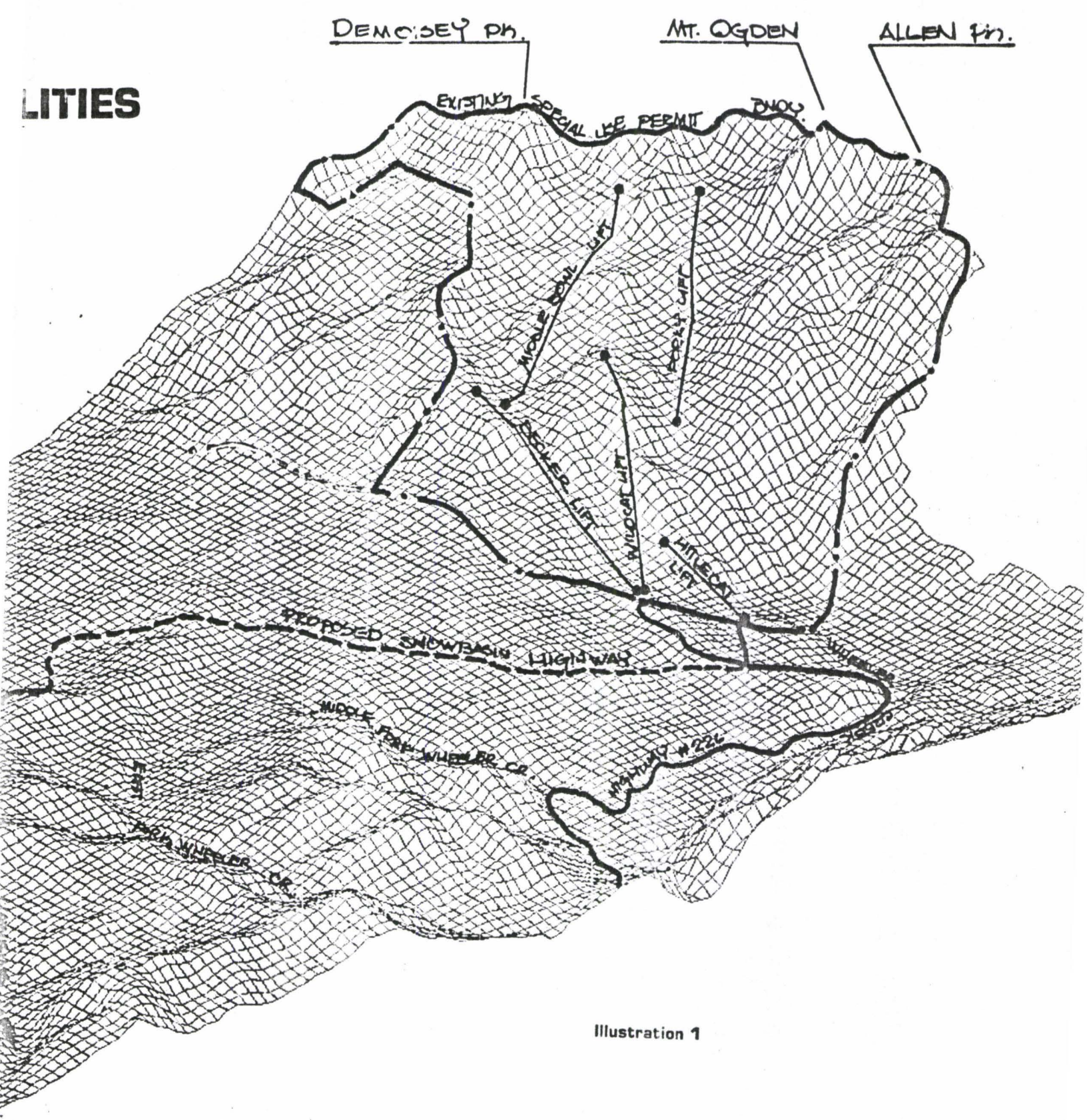
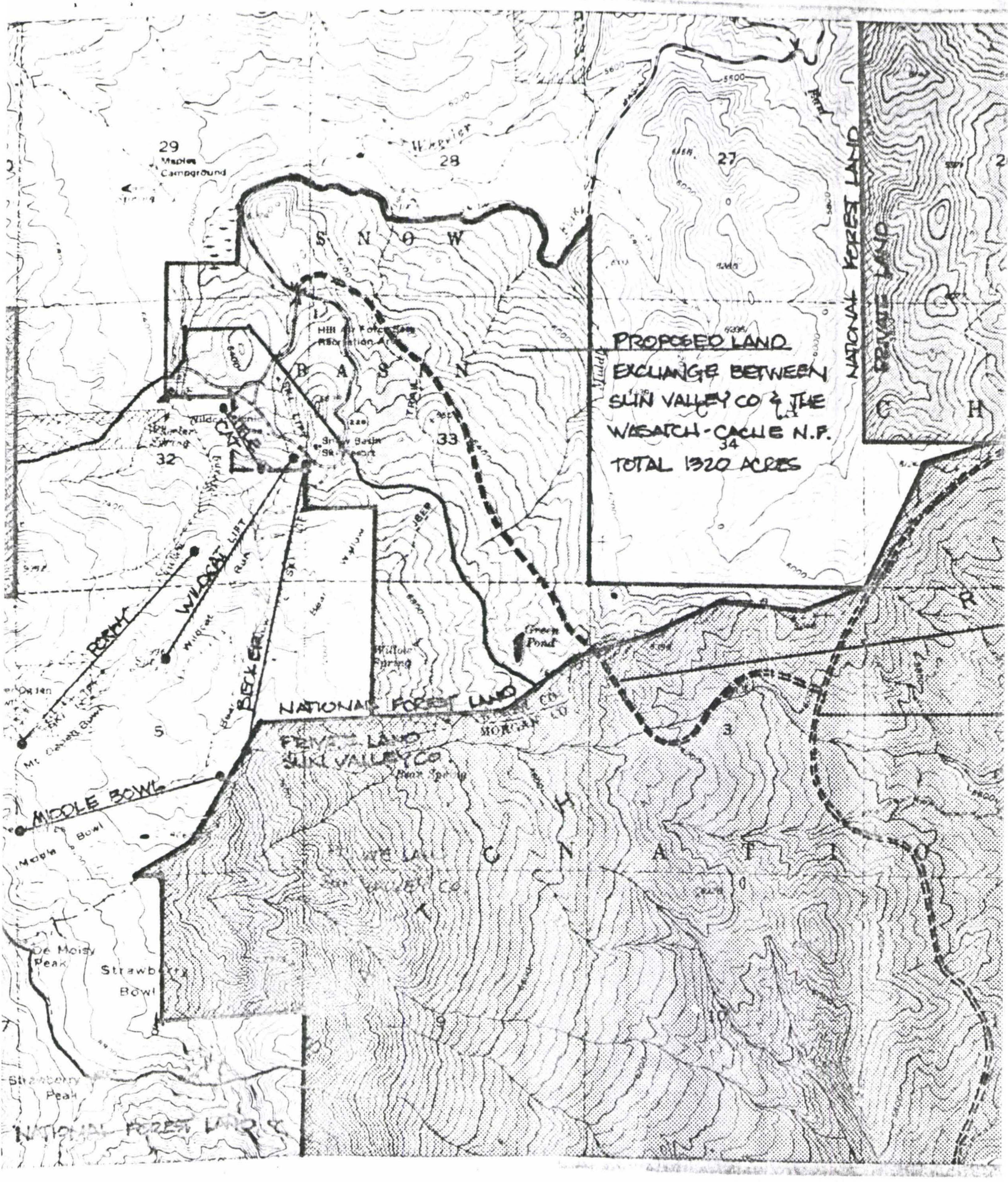


Illustration 1

to develop support facilities and overnight housing including resort hotels, condominiums, single family housing, restaurants, ski shops, and other associated facilities.

The potential for a recreation resort is very good and has been recognized for many years. Two of the previous owners have made plans for such a resort, but have not been able to implement them. One of the past problems, access, is now being solved. A two lane paved highway, Trappers Loop Highway, is presently being built from Interstate 84 in Weber Canyon to State Highway 39 in Ogden Valley (see Map C). This highway access will make Snowbasin as close and easy to access from the Salt Lake City Airport as the major resorts near Salt Lake City (Park City, Snowbird, Alta, Brighton, and Solitude ski areas). Sun Valley Company also owns 7,500 acres of private land south of and adjacent to the existing ski area. These factors, besides the excellent skiing potential (both alpine and nordic) and outstanding scenery, make the area highly suited for recreation resort development.

Sun Valley Company is preparing a formal land exchange proposal to submit to the Forest Service for 1,320 acres of National Forest Land. The exchange proposal includes the existing Snowbasin Ski Area base facilities and would tie to the existing private land to the south (see Map C). The lands proposed for trade to private ownership are necessary to develop and operate the major resort facilities from one central location.



PROPOSED LAND
EXCHANGE BETWEEN
SKI VALLEY CO & THE
WASATCH-CACHE N.F.
TOTAL 1320 ACRES
NATIONAL FOREST LAND
PRIVATE LAND
NATIONAL FOREST LAND
PRIVATE LAND
SKI VALLEY CO
MORGAN CO
NATIONAL FOREST LAND
S N O W
B A S I N
Hill Air Force Base
Recreation Area
Snow Basin
Ski Resort
Wildcat Lift
PORCH
BECKER
MIDDLE BOWL
Middle Bowl
TRAIL
Maples
Campground
Green
Pond
Willow
Spring
Mt Ogden Bowl
De Moisy
Peak
Strawberry
Bowl
Strawberry
Peak
29
28
27
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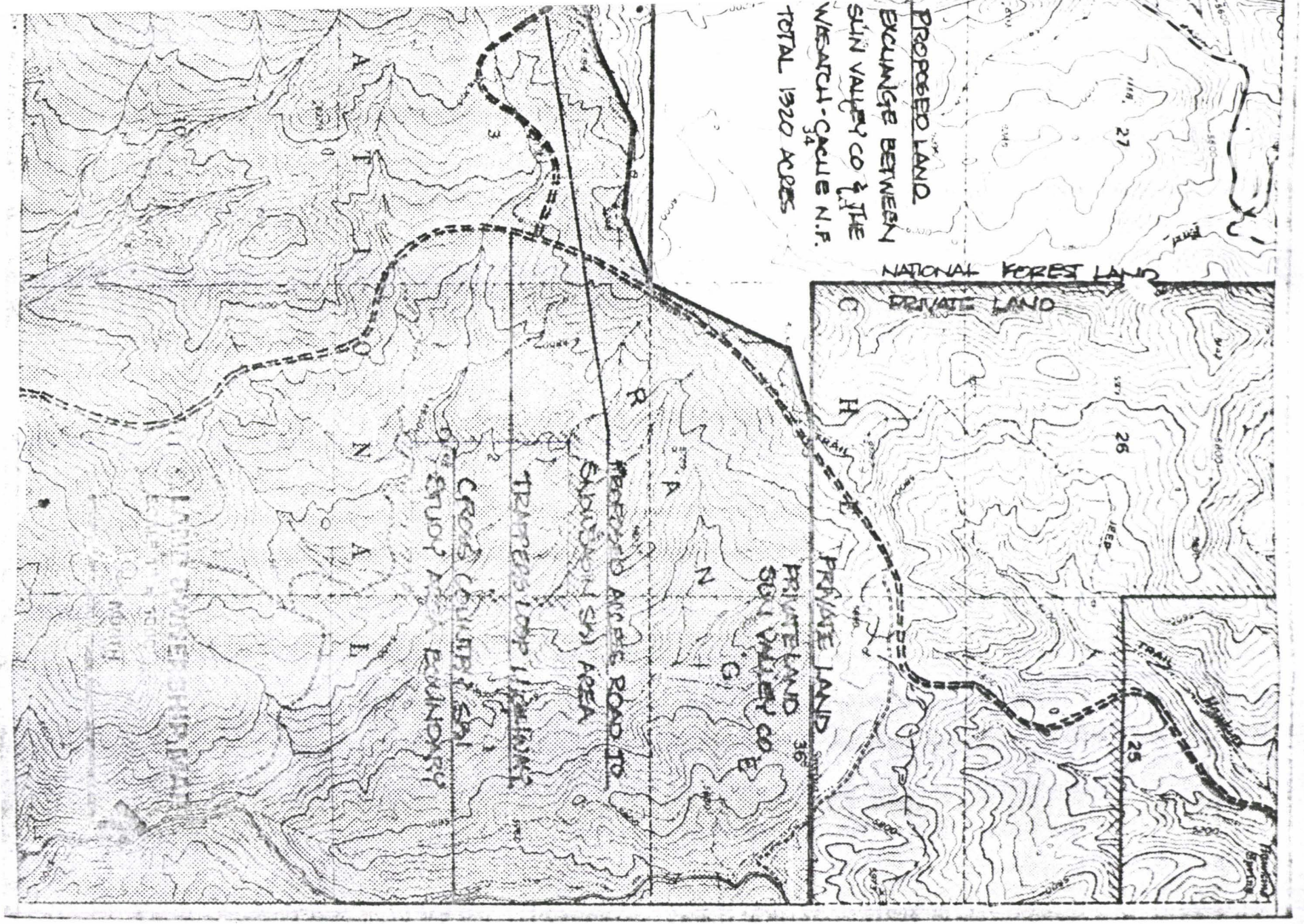

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CROSS COUNTRY SKIING AT SNOWBASIN

People began cross country skiing in the Snowbasin area in the late 1960's and early 1970's, about the time cross country skiing began to get popular nationwide. Since that time, cross country skiing has experienced a steady upward trend in recreation use. The recreation use in the mid to late 1970's was reported at 100-200 recreation visitor days and has increased to over 1,000 recreation visitor days in 1986.

There are many reasons that cross country skiing is popular in the Snowbasin area. The first reason is the terrain. East of the existing ski area the terrain flattens considerably and tends to be more rolling. The percent slope generally ranges from 0 - 30 percent with the average being in the 10-20 percent range. These gentle rolling slopes provide excellent ski touring opportunities. A second reason is plowed access and parking. State Highway 226 to Snowbasin Ski Area is plowed and parking is available at several locations including the Snowbasin Ski Area parking areas (see Map B). A third reason is outstanding scenery and solitude. The spectacular mountain peaks and the vegetation pattern combine to make the scenic quality excellent. Despite the highway and alpine ski area development, there are areas within a short distance where persons can experience a high degree of solitude. A fourth reason is the snow. Adequate snow cover normally exists over the whole area from late November/early December to late April. The Snowbasin area also generally faces north and east, therefore, the snow quality is usually very good.

At present, there are no developed facilities for cross country skiing in the area. A trail system was planned by the Forest Service several years ago, but has not been implemented. With the exception of the facilities developed for alpine skiing, adequate parking and sanitation facilities are lacking. Parking is limited to two wide spots in the road that the Utah Department of Transportation plows. There are several areas and routes used for skiing in spite of no developed trails (see Map B).

In summary, there are several important items to note.

1. Cross country skiing in the Snowbasin area, although the total numbers are not high, has experienced a steady upward trend in recreation use.
2. The physical components of the area indicate a high potential for cross country skiing, including destination facilities for this opportunity.
3. The skiing use has increased although no facilities have been developed to provide for that use.
4. A master plan for cross country skiing is needed to insure integration into the resort master plan, and to insure adequate opportunities are provided.
5. The new highway access, when completed, will lead to increased numbers of cross country skiers.

EXISTING FOREST SERVICE MANAGEMENT DIRECTION

The Wasatch-Cache National Forest Land Management Plan recognizes the recreation potential of the Snowbasin area and through goals, objectives and management guidance, has allocated the National Forest Lands in the Snowbasin

area for recreation purposes. The following is a summary of the management direction:

A. The special use permit boundary for Snowbasin Ski Area was changed adding an additional 465 areas to the special use permit. This boundary change ties the existing ski area to the private land to the south allowing expansion of the alpine skiing from 4,000 skiers at one time to over 8,000 skiers at one time (page IV-2, Land Management Plan).

B. The Snowbasin area is identified as having a high potential for cross country skiing and is the highest priority area for providing cross country skiing opportunities on the Forest. This is supported by planning for two trailheads and a trail system for cross country skiing in the Snowbasin area (pages IV-3, IV-5, IV-228, Land Management Plan).

C. The Snowbasin area is closed to snowmobile use to further enhance cross country skiing (page IV-237, Land Management Plan).

STATEMENT OF THE PROBLEM

The primary purpose and the end result of this study is to develop a master plan for cross country skiing in the Snowbasin area. There are several secondary purposes for the study that recognize the importance and timeliness of the study:

(1) To recognize the potential of cross country skiing in the Snowbasin area and provide facilities to maximize those opportunities.

(2) To implement the management direction established in the Wasatch-Cache National Forest Land Management Plan.

(3) To establish the roles of the Forest Service and Sun Valley Company in providing cross country skiing opportunities.

(4) To mitigate the loss of existing cross country skiing terrain resulting from resort development.

(5) To develop a classification system for the various types of cross country skiers based on recreation experience desired, setting desired, and facilities/services needed to guide planning for cross country skiing.

(6) To explore the use of computer systems in examining large land areas for cross country skiing suitability.

DESCRIPTION OF THE STUDY AREA

The study area encompasses 12,040 acres of land in the Snowbasin area that appear suitable for cross country skiing. It includes 5,120 acres of National Forest Land, 5,760 acres of Sun Valley Company land, and 1,920 acres of other private land (see Map C).

The north half of the area generally faces east and north and includes the three main forks of Wheeler Creek. The south half of the study area generally faces east and south and includes upper Gordon Creek and upper Dry Creek. The Weber County/Morgan County boundary line divides the study area in half and is

also the hydrologic division between the Ogden River/Weber River watersheds. (See Map B)

The vegetation pattern varies throughout the study area. The more northerly aspects are characterized by moderately dense to dense stands of Quaking Aspen, Douglas Fir, Alpine Fir, Mountain Maple, and Scrub Oak. The easterly aspects are characterized by more open mixed stands of Scrub Oak, Mountain Maple, and Sagebrush. The south and west aspects are characterized by open Sagebrush and grass areas. The overall vegetation pattern is characterized as moderately open.

The study area ranges from very steep (60%+) rocky areas on the west side to more rolling slopes in 10-30 percent range from the existing ski area to the east boundary of the area (see illustration 1).

The scenic quality of the area is high. The high mountain peaks on the west side of the study area are picturesque and create a dominant focal point, plus the visual variety of the terrain and vegetation patterns combine to make the scenic quality outstanding.

The soil types vary throughout the study area. The steep mountainous area on the west boundary and the ridge areas throughout are rocky and relatively stable. The soil types in the drainage areas have a high clay content and are prone to slumping and mass failure when saturated. One area in particular, located on the east side of Snowbasin Ski Area, is an ancient paleo-landslide and is highly unstable.

The only all year round access to the study area is State Highway 226 providing access to Snowbasin Ski Area. There are two additional roads in the study area providing summer access only. These are the existing Trappers Loop Road (single lane, gravel) located on the east side of the study area and a road from the Snowbasin lower parking area to Maples Campground, (single lane, gravel).

There are two highways, which would provide all year round access, planned within the study area. The Trappers Loop highway, a two laned paved highway connecting Weber Canyon to Ogden Valley, is scheduled for completion in 1988. A second two laned paved highway is planned as part of Sun Valley Company's resort plans. This highway would originate at the Trappers Loop Highway and connect to State Highway 226 near Snowbasin Ski Area.(See Map C)

LIMITATIONS TO THE STUDY

This study may have been limited by the following:

1. Some of the data and information contained in the study was based on the author's experience in winter recreation and knowledge of the study area; and may not be supported by hard data.

2. The cross country ski master plan was developed to fit with the current resort master plan submitted by Sun Valley Company. If the

resort master plan changes, then the cross country ski master plan may also have to change.

3. A survey of the local public was not conducted to determine local demand for the various types of cross country skiing. It was assumed that the demand for the local area would be consistent with other areas in the intermountain west.

ORGANIZATION OF STUDY

The remaining chapters of study include:

a. Review of Literature
b. Snowbasin Cross Country Ski Master Plan
c. Implementation and Further Study
d. References

CHAPTER II

REVIEW OF LITERATURE

The review of literature consists of five sections. They are: (a) Growth of cross country skiing, (b) Types of cross country skiers, (c) Motivations of cross country skiers, (d) Cross country skiing facilities/services, and (e) Operation of cross country ski touring centers.

Growth of Cross Country Skiing

Cross country skiing is centuries old in the Scandanavian countries of Europe, but mainly was used as a form of winter transportation rather than as a recreational activity. Skiing initially developed at least 1,000 and perhaps as many as 5,000 years ago. Snowshoe Thompson and other Norwegians brought their ski experience to the western United States during the gold rush days. Other miners during that time period tried the primitive long boards and found both utility and excitement in their use, (Willden 1983, p. 1,17). With the advent of uphill transportation systems and alpine (downhill) skiing over three decades ago, cross country skiing in the U.S. declined to insignificance. By the 1960's, cross country skiing was omitted, as a separate category from the 1960 and 1965 National Recreation Surveys (Van Horne, Szwak, Randall, 1985, p. 125).

Recreational cross country skiing began to grow during mid to late 1960's about the same time as the ecology or environmental movement began. Cross country skiing gave the opportunity to experience nature and solitude in the winter.

The available literature on growth statistics of cross country skiing vary, but all indicate a very rapid growth rate starting in the late 1960's to the

present. During the 1969-70 ski season some 50,000 pairs of cross country skiis were sold compared to 200,000 pairs in the 1971-72 season (Freeman, 1974, p. 12). In another study it is suggested that the number of cross country skiers rose from 2,000 to 500,000 from 1964 to 1974 (Ewert, 1975, p. 157). During the early to mid 1970's cross country skiing was reported as the fastest growing sport in the western United States (Willden, 1983, p. 15).

Cross country skiing continued to grow rapidly through the 1970's into the 80's. Dave Hammond (1981 p. 1), quoting figures supplied by Trac, Inc. (a major supplier of cross country ski equipment), states, "cross country skiing grew 30-35% from 1973-1981 and estimated there were 4.5 million cross country skiers in 1978." Jon Wiesel (1985, p.11) quoting a 1982 Nielson survey states there were 3.57 million pure cross country skiers in 1982 plus another 1.9 million cross over alpine skiers for a total of 5.47 million skiers. Wiesel (1983, p. 4) during a presentation to the U. S. Forest Service quotes a study by Nautilus Magazine that suggests the total number of cross country skiers at closer to seven million . A 1983 nationwide recreation survey concluded that there were approximately six million cross country skiers at that time (Van Horne, Szwak, Randall, 1985, p. 111).

Along with the rapid numerical growth of cross country skiing we see a rapidly changing demographic pattern. The advances made in cross country skiing equipment, the advent of groomed trails with set track, and the development of cross country ski touring centers and resorts have made cross country skiing more appealing and more inviting to the average person. No longer do we picture the cross country skier as the young gregarious male with a pack on his back breaking trail through the backwoods (Wiesel, 1984, p. 5). We see persons highly educated and increasingly affluent, a strong increase in female

participation and family orientation, a gradual increase in average age, and the activity becoming more social.

The average age of skiers has increased from 28 years old in 1975 to 30.6 years of age in 1980; to 32.4 years of age in 1982 (Fry, 1982, p. 11). A 1983 cross country skier subscriber survey indicates the average age at 34.9 years of age with 73 percent over the age of 30 (Wiesel, 1985, p. 11). The average years experience has grown from 1.5 years experience in 1975, to 3.0 years experience in 1980, to 3.8 years in 1982 (Fry, 1982, p. 38). The average income of skiers rose from $24,300 in 1980 to $33,858 in 1982 (Fry, 1982, p. 38).

The sport has changed from being almost entirely male in the late 1960's, to 80 percent male in 1975, to almost 50 percent male - 50 percent female in 1982 (Fry, 1982, p. 38; Wiesel 1984 p. 5, Wiesel, 1985, p. 11). The sport is becoming more social with a strong increase in family participation, frequently with small children (Wiesel, 1984). One study reviewed indicates less than one percent of the skiers ski alone and the average group size to be 2-1/2 people (Fry, 1982, p. 41). Another study indicates the average group size to be four people (Meyer,1982, p. 17).

The statistics vary somewhat depending upon which survey one reads, however, the trend indicates a phenomenal growth rate in pure numbers, (approximately 3,000 percent in twenty years) and a rapidly changing demographic pattern. Two conclusions can be made that are important to recreation planners, based on the above data:

1. Cross country skiing is a popular activity or sport that is showing no signs, at least over the short term, of leveling off. Therefore, opportunities should be made available whenever possible to allow people to participate in the activity.

2. When planning for cross country skiing a broader spectrum of opportunities must be provided due to the broader spectum of persons now participating. We cannot limit ourselves to just providing a plowed parking area and marking an ungroomed trail if we want to provide the kind and breadth of opportunities now desired by the public.

TYPES OF CROSS COUNTRY SKIERS

In order to provide the broad range of cross country skiing opportunities now desired by the public, we must first attempt to define the different types of skiing taking place. In terms of this paper cross country skiing or nordic skiing is used to include all aspects of the activity.

The study of available literature indicates there are eight different types of cross country skiing now taking place. These types are ski touring (off track), ski touring (groomed track), ski mountaineering, ski skating, telemark skiing, cross country ski racing, ski biathalon, and nordic ski jumping. The types of skiing and following definitions were derived from five different sources: (1) Freeman, 1974 p. 4-6, (2) Grover, 1981, (3) Wiesel 1984, (4) Wiesel, 1985, and (5) Simoneau 1985.

Ski Touring (off track) - this type skiing is the forerunner of all modern cross country skiing and refers to the recreational-leisurely aspect of skiing over snow. The skier glides along using a walking sliding motion. This type skiing occurs generally in undulating terrain offering some uphill, some downhill and some flat. Ski touring has come to mean back country skiing or skiing off track. This skier will use marked and cleared trails that are not groomed or will simply head cross country where no trails exist. To a large

degree the image of the cross country skier with the pack on his back breaking trail through the woods comes from this type skier.

Ski Mountaineering - ski mountaineering is the ski ascent and descent of mountains. These are usually expert skiers and the activity occurs in steep mountainous terrain. The primary motivating force is the challenge of ascending and descending a particular mountain or a particular area. Mountaineering equipment is heavier than touring or track equipment. The boots are stiffer, bindings more firm and the skis usually have metal edges for more control. Ski mountaineers quite often pack supplies on their backs. Winter camping and climbing, including technical rock work, are also major goals for these skiers, (Freeman, 1974).

Telemark Skiing - Telemark skiing is not a pure type as the others are. The telemark turn in cross country skiing is a type of turn used on the descent of hills and mountains. This is similar to using a parallel turn in alpine skiing. This technique is used by ski mountaineers and ski tourers to descend down a mountain or area. There is, however, an off-shoot of cross country skiing with emphasis on learning and using the telemark turn. It has become popular to ski at alpine ski resorts, riding the ski lifts up and skiing down on cross country skis, using the telemark turn. The emphasis being on learning and mastering the skill as one would a particular alpine type turn. There are also many persons who climb or ride ski lifts up into areas where they can ski long expanses of terrain using the telemark turn. The emphasis is on the skiing and the technique on ungroomed powder slopes rather than experiencing nature and solitude.

Ski Touring (set track) - Ski touring on groomed trails with set track has similarities to ski touring off track but is pursued at areas where the ski

trails have been groomed and grooves or track is set to guide the the skis. The term track refers to an alteration of snow based on setting grooves that guide the skis forward rather than permit them to splay off to the sides or cross. These grooves are the product of a vehicle pulling a sled whose extruding "moulds" compress and consolidate furrows and leave them hardened. In addition the machinery compacts snow off to either side so that only the tips of the ski poles penetrate the snow (Wiesel, 1985 p. 4).

This type of skiing obviously requires significant development and maintenance work. Trails are laid out in undulating terrain with some uphill, some downhill, and some flat. The trails, especially at developed cross country touring centers, are well marked and the degree of difficulty is signed. Trails will either follow the fall line of the slope (straight downhill or uphill) or will require construction similar to a road crossing a slope.

The equipment used for this type skiing is light and usually the skis do not have metal edges, since you are not skiing steep slopes nor breaking trail. The advantages of this type of skiing are (1) a person does not have to break trail through the woods, (2) a person is not likely to get lost, (3) a person does not need a high degree of technical ability to participate and (4) quite often there are developed support facilities associated with the activity. The disadvantages are (1) persons are limited to skiing areas where trails are groomed, (2) more people are usually skiing the area, and (3) usually a fee is charged for use of the track.

Ski Skating - This is a relatively new type of cross country skiing. This type skiing requires a groomed trail but does not require set tracks. The skiers use ultra light equipment and the activity generally occurs in relatively flat

terrain (± 6 percent gradient). Ski skating uses a technique similar to ice skating, only on skis. The skier must push the ski out to the side alternately on one ski and then the other. Ski skating has even evolved into separate types based on techniques: double pole technique, single pole technique, V skating, and marathon skating (Simoneau, 1985).

Cross Country Ski Racing - This is an endurance sport requiring tremendous physical stamina. A skier uses the lightest equipment possible for races lasting up to three hours or more. The races occur over a measured distance (up to 50 Kilometers) on a prepared track and speed is essential (Freeman, 1974), p. 4). This is a competitive sporting event similar to foot races versus a leisure recreation activity. Besides the traditional cross country ski racing on set track there are also competitive ski skating races.

Cross Country Ski Biathalon - This is a competitive, racing event combining cross country ski racing and rifle marksmanship. The skiers ski on a groomed track adjacent to target locations. The skiers stop at these locations, fire at the targets, and ski on to the next stop. The object is speed in finishing the course with the best marksmanship (Freeman, 1974, p. 67).

Cross Country Ski Jumping - This is another competitive event where skiers ski down ramps of set distances and jump the farthest down the slope they can. They are judged based on distance jumped and form. Heavy wide skiis are used for this event that have several grooves on the bottom. There is also another type of ski jumping called "ski-flying". This is a daredevil sport in which participants ski down steep inruns, reaching speeds of 80 mph before jumping. Sometimes jumpers reach distances of more than 500 feet. The hill is especially contoured to allow the skier to remain in the air as long as

possible, following the slope of the hill. Distance and body position are used to judge the event (Freeman, 1974, p. 6).

For planning purposes the skier types become very important. There are many similarities between the types but there are also many differences, such as equipment used, terrain desired, and experience wanted. A planner can no longer simply plan for cross country skiing. The different types must be recognized and planned for individually in order to be successful.

MOTIVATIONS OF CROSS COUNTRY SKIERS

Another important aspect of planning for any recreational activity is to determine what motivates a person to participate in that activity. The kinds of satisfactions and benefits that define a high quality recreation experience as well as the kinds of physical settings persons prefer is a key planning step. The recreation experience rather than the activity is the real final product of recreation resources planning and management.

There are several studies that have been completed indicating why people cross country ski. These studies, generally, agree with one another on the main motivating factors, but minor variations exist depending on the perspective of the author. For example, if the author is writing about ski touring on groomed track there are minor differences from an author writing about ski touring off track or cross country skiing in general.

One of the most extensive studies done on motivations or satisfactions derived from cross country skiing indicate that out of 55 reasons for cross country skiing the six most important are: (Ballman, 1980).

1. Exercise and fitness
2. Experiencing nature
3. Achievement and technical accomplishment
4. Social contact
5. Escaping social and psychological pressures
6. Family solidarity

Ballman surveyed 944 persons in the state of Minnesota to determine the factors. Since these factors agree with other studies done, they can be broadly applied and used in the western U.S.

In the same study Ballman was the first to formally recognize that a cross country skier spectrum exists. Ballman grouped the 944 respondents of the study into eight different types based on how they rated the six motivational factors. Some of the respondents rated exercise and family solidarity higher than the other four factors and thus were placed into one type. Other respondents rated appreciating nature and escaping social and psychological pressures more important and were placed into another type. The importance of this study for recreation planners is to recognize that the spectrum exists and to recognize the type or types being planned for.

Gary Willden (1983) in a study of leisure attitudes of alpine and cross country skiers in Utah indicates that freedom and solitude are the prime motivational factors for cross country skiing. He also indicates physical fitness as being important, even surpassing jogging and swimming. Another factor not mentioned previously, is that the cost of equipment, clothing, and accessories is much less for cross country skiing versus alpine skiing, therefore, economics becomes a motivating factor, also.

Willden, also, explores in detail the idea that "risk" is another critical psychological factor in personal outdoor recreation choices and is one of the fundamental themes of outdoor recreation. Risk recreation is defined as those leisure pursuits which includes elements of excitement, challenge, thrill, adventure and danger. The risks of the activity are accepted as one participates, but they are first analyzed, evaluated, and limited before the acceptance occurs. Another important aspect of risk is most people will upgrade their risk as they upgrade their skills, thus skiers will seek out more demanding slopes and areas to ski as their skill increases. Different people will view the same activity differently as to how risky it is and that perception is based on a person's attitude, history, and self confidence level.

One important conclusion drawn from the study and its importance here is that cross country skiing as a whole is perceived as a relatively safe activity versus alpine skiing. Many of the participants have chosen cross country skiing because of the perception that it is safer and less risky.

John Krammer, in a recreation management short course paper, states that in three separate studies that exercise was listed as the principal motivating factor for cross country skiing and experiencing nature was listed second. Another study Krammer reviewed stated that views of natural scenes and trails going through forests are important factors in motivating skiers. Kramer also reports that a study of 682 skiers along the Colorado Rockies rated their preference from among 19 experiences. Four of the top five experiences related to experiencing nature and keeping physically fit rated fourth.

Jon Wiesel from National Nordic Consultants, in a presentation to the U.S. Forest Service (1983), lists the following reasons why people ski tour on set track:

1. Technical ability and accomplishment
2. Exercise
3. Social experiences
4. Enjoying a winter environment
5. Good way to learn to cross country ski

Wiesel, in a paper written in 1984, refined and added to the list of motivational factors. In this paper he lists the following reasons why people ski tour on set track:

1. Optimal introduction to cross country skiing
2. Exercise
3. Technical accomplishment
4. Social experience
5. Leave civilization pressure behind
6. Experience winter environment
7. Low injury occurrence
8. Minimal chance of getting lost

In summary, the literature reviewed indicates, almost unanimously, that the prime motivational factors for persons cross country skiing are as follows:

1. Experiencing nature in a winter environment and solitude
2. Exercise and keeping physically fit
3. Achievement and technical accomplishment
4. Social contact and experiences
5. Escaping psychological and civilization pressures

6. Low cost to participate

7. Low injury occurrence and low perceived risk

8. Excellent family activity

It is important to examine these motivational factors as they relate to the different skier types. The different types of cross country skiers, if asked to rank this list of motivational factors, would rank them differently depending upon the recreation experience desired.

Ski Touring (off track) - Ski touring off track in the U.S. seemed to grow out of the ecology or environmental movement of the late 1960's and early 70's. Cross country skiing gave these persons a way to experience nature in the winter as hiking did in the summer. Many of these early skiers in the U.S. were seeking a harmonious balance between man and the environment (Freeman, 1974). The persons, therefore, are primarily motivated by experiencing nature and solitude, exercise, and escaping civilization's pressures.

Ski Mountaineering - Ski mountaineering is an off shoot of ski touring (off track). Therefore, they are seeking the same type of experience or are motivated to ski for the same reasons. Ski mountaineers are different, however, in that technical accomplishment is a prime motivational factor. One of the prime objectives is the challenge and skill in the ascent and descent of a particular area or mountain peak. The excitement, challenge, thrill, adventure, and danger associated with ski mountaineering are important to the participants (Willden,, 1983). Some individuals pursue this activity for the love of challenge, others for self testing, camaraderie, exploration, aesthetics, or communication with the natural world. Many simply seek a change of pace or change of focus in their lives which allows temporarily for them to

forget about worldly problems.

Telemark Skiing - This type skier, as defined earlier, pursues this activity primarily for achievement and technical accomplishment. Most telemark skiers especially the ones skiing at alpine resorts, are alpine skiers attempting to master a new skill (Wiesel, 1985). These skiers are also seeking the social experiences that alpine skiing offers. As the telemark skier ventures outside developed alpine ski areas to natural areas with ungroomed slopes, these persons are again motivated by technical accomplishment, but begin to cross over to ski mountaineering where risk is upgraded and the motivational factors of ski mountaineering become important.

Ski Touring (set Track) - The two great virtues of track skiing are that it provides an optimal introduction to cross country skiing and then maintains the variety to keep the participants involved. It opens enjoyment of winter to people who would otherwise never take the initiative or the risk to venture out on skis into a winter environment (Wiesel, 1984).

Cross country touring centers with set track have changed the overall demographics of cross country skiing. At least half of the recreational track skiers are women; a majority are over 30; and great numbers are family groups, frequently with small children. A very high proportion are urban residents with little winter recreation experience (Wiesel 1984).

Since track skiing requires land development activities and is usually associated with a touring center or alpine ski resort, the motivation to ski deviates from experiencing a natural environment and solitude. Track skiing occurs in a structured environment with well marked trails and usually includes additional services developed for the convenience of the skier.

The main motivational factors inducing this type skier to participate are exercise, technical accomplishment, social contact, safety and less risk, and family solidarity.

Ski Skating - Ski skating participants have similar motivations as persons ski touring on set track, however, the emphasis on ski skating is on speed and endurance through perfecting the technique. Skating requires good upper body strength. Therefore, ski skating participants are motivated to participate mainly for physical exercise, and technical accomplishment (Simoneau, 1985).

Cross Country Ski Racing, Ski Biathalon, and Ski Jumping - These are competitive sporting events, therefore, the motivation to participate are the same for all three. The primary motivating factors are achievement, perfecting technical ability, and social experiences.

CROSS COUNTRY SKIING FACILITIES AND SERVICES

As with any recreation activity there are certain facilities needed in order for persons to participate in the activity. There are also certain services that can be provided to provide user convenience, user safety, or user enjoyment. This section of the literature review will examine the facilities and services associated with cross country skiing and then will examine the facilities and services needed by each type of skier.

Access and Parking - These two items are the most basic and critical items needed to provide cross country skiing. Persons need reasonable access and parking to get to an area suitable for skiing. Since this is a winter activity, plowing the snow from the road and parking area is a necessity. The road and parking area can be paved or gravel as long as it is plowed regularly. Two wheel drive vehicles should be able to access the area.

There is no standard formula for determining the size of the parking area to be provided. Size is a function of several variables. Those variables are:

1. Amount of land available where construction of the parking area is feasible.
2. Size of the area to be served including the length and number of ski trails.
3. Number of people expected to ski the area and the capacity of the trail system.
4. Number of people expected per vehicle.
5. Number of access points to the area or ski trail system.

In remote areas with few people, parking may be a mere widening of a roadway; in dense populated areas full scale parking lots are necessary (Knopp and Maloney, 1973).

Sanitation Facilities - Sanitary facilities should be provided at trailheads and again the size and extent is dependent upon the amount of expected use and the type of area served (Knopp and Maloney, 1973). Flush toilets are the optimum sanitary facilities, but vault toilets or portable toilets will meet the need.

Again, there were no formulas discovered in the literature that specifies number of sanitary facilities to provide. However, there are two sources of information specifying numbers of facilities for general recreation developments. These sources are Forest Service Manual 2330 and the Weber County Campground Ordinance. The Forest Service Manual states that as a general rule to provide one seat per 35 people served. The Weber County Campground Ordinance specifies that one two-unit toilet is needed for every 15 camp units. This translates to one seat per 50-75 people.

Cross Country Ski Trails - Besides parking and access, suitable ski terrain and ski trails are the next most basic need for cross country skiing. Although skiers can travel over almost any snow covered terrain, trails make traveling easier and reduce the chance of becoming lost. An overview of the total area is needed first to determine if the area is attractive for cross country skiing. The following are general criteria for analyzing potential ski areas: (Knopp, Maloney, 1973; Bourgois, 1982; Christiansen, 1978; Alesch, 1980; Meyer, 1982).

A. Climate - Obviously snow is needed. How much snow and how long it stays on the ground are the key considerations. If good sledding conditions exist for two to three months of the year, ski conditions should be adequate. In the intermountain west areas above the 6,000 foot elevation range are the most desirable. At these elevations snow usually keeps a good base with a fine, light surface consistency following each storm. Areas below 6,000 foot are suitable, but are much more subject to icy conditions and short season management. As a minimum, 8" - 10" of snow are needed, but more realistically 18" and above are much better. Snow making can extend the ski season, but requires large quantities of water and high capital expenditures.

B. Location - The distance the skiers have to travel and size of the Skiable terrain are important factors to consider. How attractive the area is in terms of terrain, vegetation, and whether the area has food service and lodging is also important. A large attractive area will bring skiers from a hundred miles around and a small area will depend on the local skiers. These factors, especially the number of potential users the area can draw on, can help determine the amount of time, effort, and money to be invested in cross country ski trails.

C. Topography - Although cross country skiing can be done on relatively flat land, it is much more enjoyable where there are rolling hills and a variety of terrain features. Ideally trails should be located in areas where topography is fairly rolling. An even mixture of uphill, downhill, and level terrain is optimum. (This applies to ski touring on and off track, but does not necessarily hold true for ski mountaining and Telemarking.)

D. Aspect - As a general rule avoid locating trails, especially at lower elevations, on open, unshaded south or west facing slopes. Areas with north and east facing slopes will retain snow longer and in better condition. However, north facing slopes are much colder and usually more densely vegetated. South slopes can be used at higher elevations where snow is deep and can be guaranteed throughout the ski season.

E. Wind - Windy areas are undesirable for two reasons. Open slopes exposed to frequent wind affects snow condition. Wind will scour the slopes and create hard icy conditions to ski on. Wind is also undersirable to the skier. Long, cold, windy slopes will be avoided by skiers.

F. Vegetation - Vegetation patterns are important for several reasons. Vegetation will create better snow conditions by shading it from the sun. This will keep the snow from developing crusty, icy conditions. It also helps block the wind to prevent wind scouring and hard slab conditions. Heavy vegetation reduces snow loss and can extend the ski season. Vegetation also contributes to the variety of the trail. The variety created by a mixture of heavy cover, open slopes, and meadows offer a much more enjoyable skiing experience than the monotany of all open or all heavy dense vegetation. Vegetation is also important to screen one trail section from another providing more opportunities

for solitude. Vegetation provides shelter for wildlife, which can add great interest to the winter scene.

C. Aesthetics - The overriding principle in trail aesthetics is to provide visual variety. Enclosed areas can be routed to take advantage of views, vistas, and points of interest. Contrasts to the dominant landscape are encouraged and change will hold the interest of the skier. Unique landscape features or man made features (i.e., historic sites), can also add attractiveness to the area. The trail planner by providing variety in topography, vegetation, views, and points of interest, can develop a very interesting and challenging ski trail.

Once an area has been established as suitable for cross country ski trails, the next step is to research and analyze the specific trail design standards and criteria. The literature reviewed indicate that percent slope, trail gradient, trail difficulty, trail patterns, trail length and width, turns and runouts, and trail signing are important factors when designing ski trails(Knopp, Maloney, 1973; Christiansen, 1978; Bourgois, 1982; Meyer 1982).

Trail Layout Patterns - Trail designs are as varied as the land on which they lie and are a function of available topography. There are, however, several basic patterns which can be followed in designing a trail system. Trails should be designed and clearly marked for one way traffic for the following reasons:

1. Safety - eliminates collision hazard on hills;
2. Efficiency - eliminates congestion, simplifies trail design, and construction;
3. Enjoyment - allows the trail to carry more traffic without decreasing a sense of solitude by minimizing encounters between skiers.

The following are suggested conceptual ski trail patterns:

1. Simple Loop

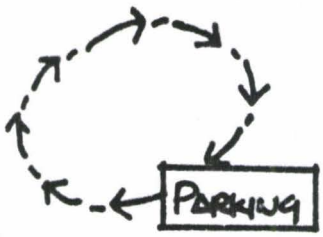


FIGURE 1

The simple loop is a one-way, very straight-forward network. This configuration works well for short trails and usually requires minimal signing. Because it is a one-way system, the number of users at one time can be fairly high without significantly degrading the trail experience. However, skiers may lose interest after using the trail a few times. It is not recommended to use this pattern for long trails unless the user is well informed of the length.

2. Clustered Loops

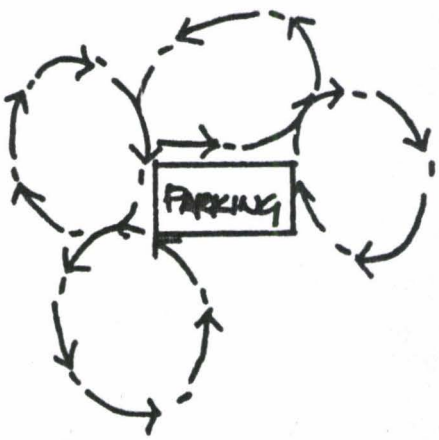


FIGURE 2

Loops can be clustered to share common parking facilities. Systems like these can take full advantage of terrain variations and offer a wide variety of

experience levels and trail lengths. Loop clusters are high density configurations with parking availability as the factor determining how many persons can use the trail at one time. Special attention needs to be given to signing at trailhead facilities to clearly indicate loop locations, lengths, and degrees of difficuilty.

3. Stacked Loops

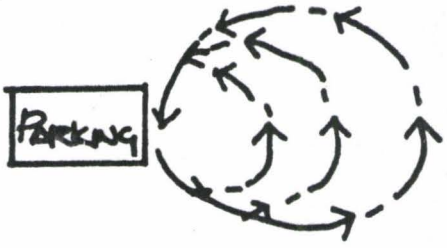


FIGURE 3

Similar to clustered loops, stacked loop systems can provide the skier with a wide variety of terrain and experience levels. Along the course of a trail, the skier may choose to make his or her trip longer or shorter. Here, also, parking is usually the factor limiting the number of users. Trail cut-offs and intersections should be well marked and distances distinct.

4. Primary Loop w/Satellites

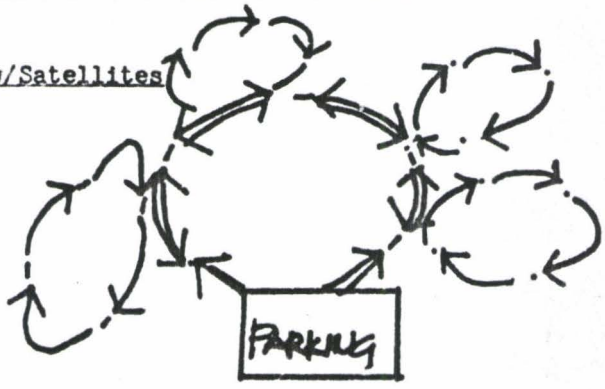


FIGURE 4

This is a good system for dispersing users and accomodating a maximum number

of skiers. Satellite loops offer more possibilities for solitude than other loop networks. Spur loops can work as excellent routes to natural features located just off the primary loop. Special care needs to be taken to sign intersections as well as widening trails and reducing grades at juctions. The primary loop should be a two-way system to allow the skier to reach satellite loops with minimal time spent on the primary access.

5. Maze

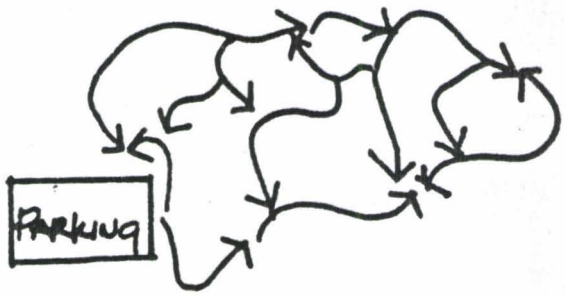


FIGURE 5

Obviously, this system maximizes use of an area as well as maximizing skier encounters. Users can explore numerous trails with a good chance of getting lost in the system unless well marked. Skiers can either shorten or lengthen their trips and atttempts should be made to mark distances at intersections. Particular care should be taken at trail junctions to provide safe and well marked trails.

6. Dendritic

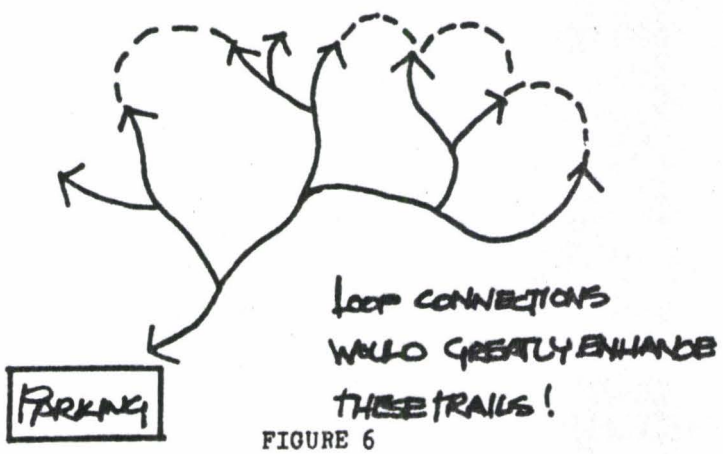


FIGURE 6

The dendritic pattern is the logical outgrowth of trails located along road systems and drainages. Trails like this disperse use; however, the number of skier encounters is high which detracts from the trail experience. Dendritic patterns can easily become confusing and good signing is a necessity. Dendritic networks can often be improved by connecting trail ends into loops.

7. Point-to-Point

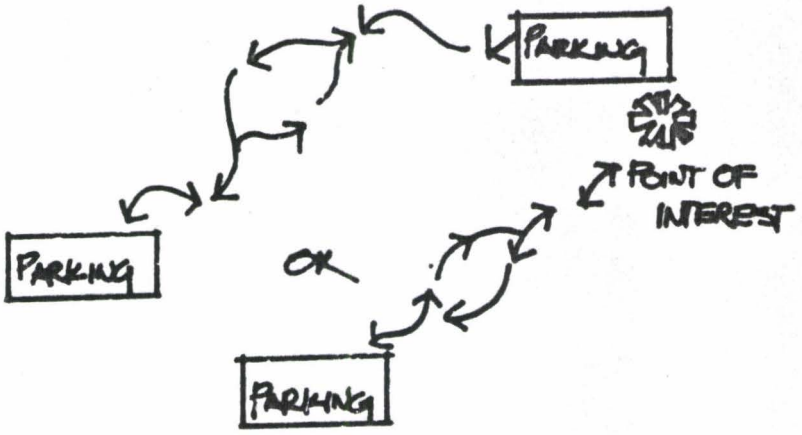


FIGURE 7

These are excellent trails for goal-oriented skiers or for long downhill stretches when shuttles are available. These also serve as an excellent means for getting skiers into interesting natural or cultural features. If using this type of trail for extended downhill trips, be sure to acknowledge differences in snow conditions that may occur as a result of changes in elevation. As is true for loop trails, signing can be kept to a minimum; flagging is usually sufficient. However, the user must be informed of the trail length and degree of difficulty.

Percent Slope and Trail Gradient

The percent slope and trail gradient are important factors in trail layout and

design. The gradient both climbing up as well as coming down is important as well as the ability class of the skiers to negotiate the grades going up and down. The less experienced the skier the flatter the trail gradient will have to be and vice versa. Another factor to consider is the length of the gradient. Persons can negotiate steeper gradients if they are short, but the grade of the trail will need to be flatter if the grade is long and sustained. On the trails intended for general use with all levels of skiing a 12 percent slope should be maximum except for short drops. On any slope greater than eight percent trails should be wide enough to allow skiers to snowplow down or "herringbone" up. Slopes steeper than 30 percent should have trails wide enough to allow side steeping up or down. To flatten the grade on trails up or down steep hills use a traverse back and forth across the hillside. Be sure to allow space for a kick turn where the trail changes direction (Knopp, Maloney, 1973).

There seemed to be greatest disagreement among the authors about the maximum percent grade for trails. Meyer (1982) suggests 25 percent is the maximum. Knopp and Maloney (1973) suggest 40 percent and Bourgois (1982) suggests 60 percent. This maximum grade depends on a number of variables. The type of cross country skiing to be provided is key. Ski mountaineers and telemark skiers ski slopes greater than 60 percent. For general ski touring trails grades should not exceed 25 percent except for short distances. For ski touring on a groomed track, the maximum slope the grooming equipment can negotiate and set track efficiently needs to be considered. For ski skating a 12 percent grade is maximum because a person cannot skate up steeper slopes. There is really no maximum grade for ski trails. The maximum grade is a

function of the type skiing, the length of the steep grade, and the ability class of the skiers. In terms of safety, though, ski trails should not be located on slopes steeper than 60 percent because of avalanche danger.

The following table considers the factors of ability class of the skier and the length of the gradient to suggest maximum trail grades (Bourgios, 1982). The table can be used for general trail planning purposes.

Maximum Trail Grades *

Gradients Experience Level	Sustained 30M (97.5')	Short 10-30M (32.5' to 97.5')	Very Short 10M (32.5')
Easiest	8%	12%	20%
More Difficult	12%	20%	40%
Most Difficult	17%	40%	40-60% **

* Straight trail - no turns ** Only on broad, open slopes

TABLE 1

Trail Width - The width of trails again is a function of several variables. The percent gradient of the trail affects width in that the steeper the grade the wider the trail should be. The trail width is also affected if skiers are side by side or in single file. The type of skiing being planned for also affects width. A trail four feet wide can be used for ski touring (off track) if the trail gradient is less than eight percent; however, if planning a set track trail system with a skating lane the width would need to be 26 feet wide.

The following trail width table suggested by Bourgois is a good starting point for general ski trails and considers the factors of percent grade, one vs two skiers, intersections, bridges, and terminus of trails.

Recommended Trail Widths

TRAIL	GRADE	MINIMUM WIDTH
STANDARD		
ONE SKIER	0-8%	4'-6'
	0-8%	6' to 8'
TWO SKIER	8-20%	8'-10'
	20-40%	10-21'
	40%+	OPEN SLOPES
INTERSECTIONS W/OTHER TRAILS	0-5% IF POSSIBLE	TWICE THE TRAIL WIDTH ENTERING THE INTERSECTION IF STEEPER THAN 5%. SIGHT DISTANCES -50' FOR BOTH TRAILS
W/OTHER TRANSPORTATION SYSTEMS OR STREAMS	0-3%	TWICE THE TRAIL WIDTH ENTERING THE +

TRAIL	GRADE	MINIMUM WIDTH
BRIDGES	0-3%	4' IF HANDRAILS ARE PROVIDED AND SIDES ARE 1'-2' HIGH. 6-8' IF SNOW IS MAINTAINED FLAT OR IF SIDEBOARDS ARE USED
BEGINNING & END OF TRAIL	0-5%	CLEAR A SPACE WITH A DIAMETER 3 TIMES THE WIDTH OF THE TRAIL THAT ENTERS OR LEAVES THE AREA.

TABLE 2

Trail Lengths - Trail lengths are a function of the ability class of the skier, the amount of time one can spend skiing, and the physical condition of the skier. Skier types is also a factor when planning trail lengths because a skier can ski farther on a groomed, packed trail than an ungroomed trail, especially with fresh snow. The key is variety. The trail system should allow for short loops that can be skied in half a day by a novice and longer loops for intermediate or expert skiers skiing all day.

The following table can be used as a general reference point for planning ski trails and considers the ability class of the skiers and amount of time they have to spend (Bourgois, 1982).

Recommended Trail Lengths

Degree of Difficulty	Half Day		Full Day	
	km	mi.	km	mi.
Easiest	5	3.1	10	6.2
More Difficult	7.5	4.6	12.5	7.75
Most Difficult	10	6.2	15+	9.3+

TABLE 3

To have a system of trails that will keep skiers interested and provide a variety skill levels, the system should have a minimum of 10-15 kilometers of trail.

Turns and Run Outs - Uphill turns on one-way trails need only be wide enough to allow herringbone or side step techniques. For downhill turns on moderate slopes, the trail should be wide enough for snowplowing. As slopes get steeper, adequate space must be left clear on the downhill side of the turn to allow skiers who miss the turn to stop safely. Downhill turns should be gradual and attempts should be made to avoid laying out turns in excess of 30 degrees (measured as a deflection angle; see diagram on table 4). Never use turns in excess of 90 degrees except on steep stretches where traversing is necessary.

Turnouts are cleared areas at the bottom of hills on sharp turns that allow the skier to slow down and gain control before the next turn or hill. Runouts should be provided on sharp (30-60 degree) or very sharp (60+) turns on slopes in excess of 12 percent grade. The following table indicates clearing widths for ski trails and also when runouts are necessary. These are based on percent slope and degree of turn (Bourgois, 1982).

Minimum Trail Widths and Turns

Grade \ Turn*	0-30°	30-60°	60°+
0-8%	5-10'	5-12'	6-14'
8-12%	10-12'	12-14'	14'w/Runout
12-20%	12-14'	14'w/Runout	14'w/Runout
20-40%	14-21'	14'w/Runout	Not Built
40-60%	21'+w/Runout	No Turns	No Turns

Easiest
More Difficult
Most Difficult

*Turns are measured as deflection angles off tangents.

TABLE 4

Trail Signing - Signing trails at the trailhead and along the route serves a multitude of functions. It gives a trail identity and also gives important information. Trail signs are also vital to indicate trail direction.

Trailhead signs should depict the entire trail system and should be placed at the access point of the trail system near or at the parking area. These signs should include a graphic representation of the trail system, level of difficulty, special hazards, unique features, geographic references, distances, rules and regulations, and locations of facilities (for example toilets and shelters).

The following is an example of a trailhead sign.

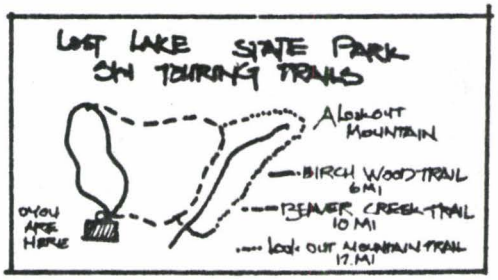


FIGURE 8

Trail signs for individual trails should include name of the trail, length of the trail and the degree of difficulty. These signs are placed at the beginning points of the trail. The following is an example of a trail sign that is placed at the beginning of a trail:

Individual Trail Sign

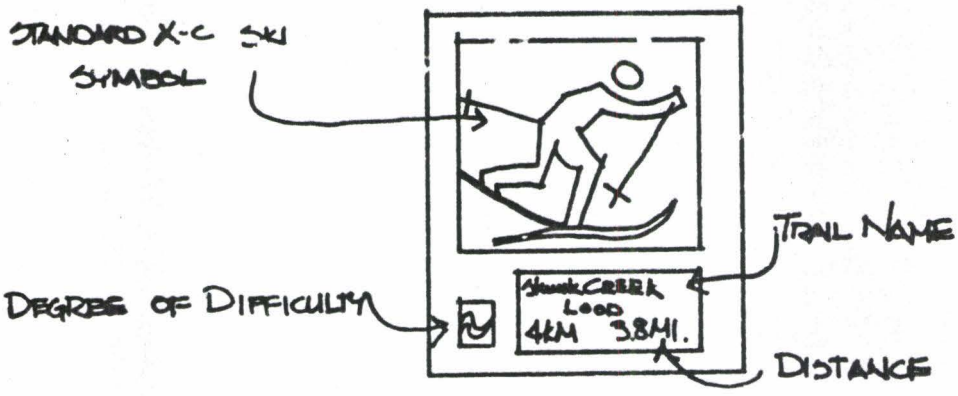


Figure 9

Note: The degree of difficulty should use the terminology easiest, more difficult, and most difficult. The graphic symbol designation used at alpine ski areas to indicate difficulty levels and/or the words themselves can be used.

Degree of Difficulty Symbols

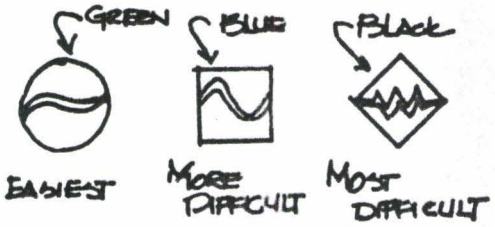


FIGURE 10

Cross Country Skiing Support Services - In order to make cross country skiing more attractive to larger numbers of people, different services can be added to complement the basic trail system. These services make skiing more convenient, more enjoyable, and safer to the using public. The basic trail systems may be improved by adding better signing, rest areas, and shelters along the trail.

The single most important service to add is groomed trails. This changes the whole image of cross country skiing and brings it from the young, gregarious male out breaking trail in the back country to a recreational activity in which almost anyone could participate. Groomed trails serve to convert nordic skiing from a walking to a gliding sport. Good track setting and support services transforms cross country from slogging into skiing, drudgery into gliding, and exercise into excitement (Wiesel, 1985). Groomed trails changes the emphasis of cross country skiing from people wanting to experience nature and solitude in the winter to people wanting to experience technical accomplishment, physical exercise, and social/family experiences in a more developed atmosphere.

As the development barrier is crossed with groomed trails, other services may be added to complement the trails, thus the activity begins to take on a character of developed alpine skiing. Ski rental and retail sales facilities may be added as well as food service and lounges. Ski schools and ski patrols may also be added. Overnight accommodations, guided tours, and hut systems may be developed to provide overnight accommodations on the trail. All of these services can and has revolutionized cross country skiing. It has also served to expand the spectrum and diversify the activity as a whole. We now see major destination cross country skiing resorts being developed (for example Royal

Gorge), and developed alpine ski resorts providing cross country ski touring centers and set track trails.

This diversification has been good for cross country skiing and has contributed to significant growth of the activity. It has, however, complicated recreation planning for the activity. Planners have to examine the type experience to be provided and the support services appropriate for that experience. The literature was reviewed to examine the support services being provided to determine the basic information needed in order to plan for them. The following is a compilation of that information.

Shelters and Rest Areas - Shelters and rest areas add to the attractiveness of any trail. The basic premise is to provide an area skiers can stop, rest, and eat lunch; and do so in a protected area that is out of the wind. The simplest facilities can be an ordinary log in a protected area to allow a place to sit down for a few minutes along the trail. Constructed benches and picnic tables can serve the same function. Shelters can be as simple as pine tree wind screens or can be three sided roofed structures with fire circles or fireplaces. In some situations a food service facility with fireplace can be developed as part of the trail system to provide a shelter and rest area (Knopp, Maloney, 1973).

Groomed Trail Systems - There are several types of groomed trails. These range from packing snow into a level flat surface similar to a groomed snowmobile trail, to packed surfaces with groves set to guide the skis, to ski skating trails. The most common is the packed surface with set grooves referred to as "set track".

All sources reviewed are in agreement with the amount of trails needed in order

to provide a variety of trails for each ability class (Knopp, Maloney; Bourgois, Meyer; Kramer). The minimum trail system should have 10 kilometers of trails, however; 15 - 20 kilometers is more desirable.

Planning groomed ski trails is similar to the guidelines developed earlier. The basic criteria on location, aspect, wind, aesthetics, and snowdepths would be the same. There are differences, however, due to the physical limitations of grooming equipment, densities of skiers, and the type of grooming being done.

A. Set Track Ski Trails - Since the experience desired by the skiers is more socially oriented, more oriented toward exercise, and more oriented toward technical ability, persons will accept higher densities of skiers on the trail system. These persons will also accept and probably expect more developed facilities. The first implication of this is that higher densities of people will require large parking areas and more sanitation facilities. Also, there is usually a fee for use of the trail system, therefore, parking will have to be centrally located at the main entrance to the system in order to control the use and collect the fees.

   Conceptually, trail layout and planning will follow the guidelines established earlier except for the following:

   Trail gradient criteria would be the same as developed earlier except for the upper limit. Due to the physical ability to groom and set track the upper limit would be approximately 30-40 percent. On any slope greater than eight percent except for very short lengths, trails will have to be such that a person can "snowplow" down or

"herringbone" up (Knopp, Maloney, 1973). If routes used are greater than 30-40 percent, they should be open slopes packed similar to an alpine ski run to allow for adequate turning and control of speed. Areas such as this can be designed into the trail system for expert skiers to learn and practice "Telemark" turning.

These ski trails will have to be designed to follow the fall line of the slope (straight up or down) because it is not feasible to groom and set track across the general slope of the hill. A flat cross section should be constructed, similar to constructing a road, if necessary to cross a slope (see figure 11).

Ski Trail Cross Section

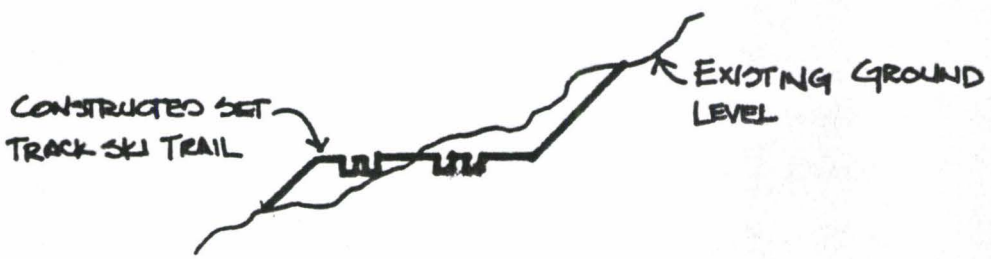
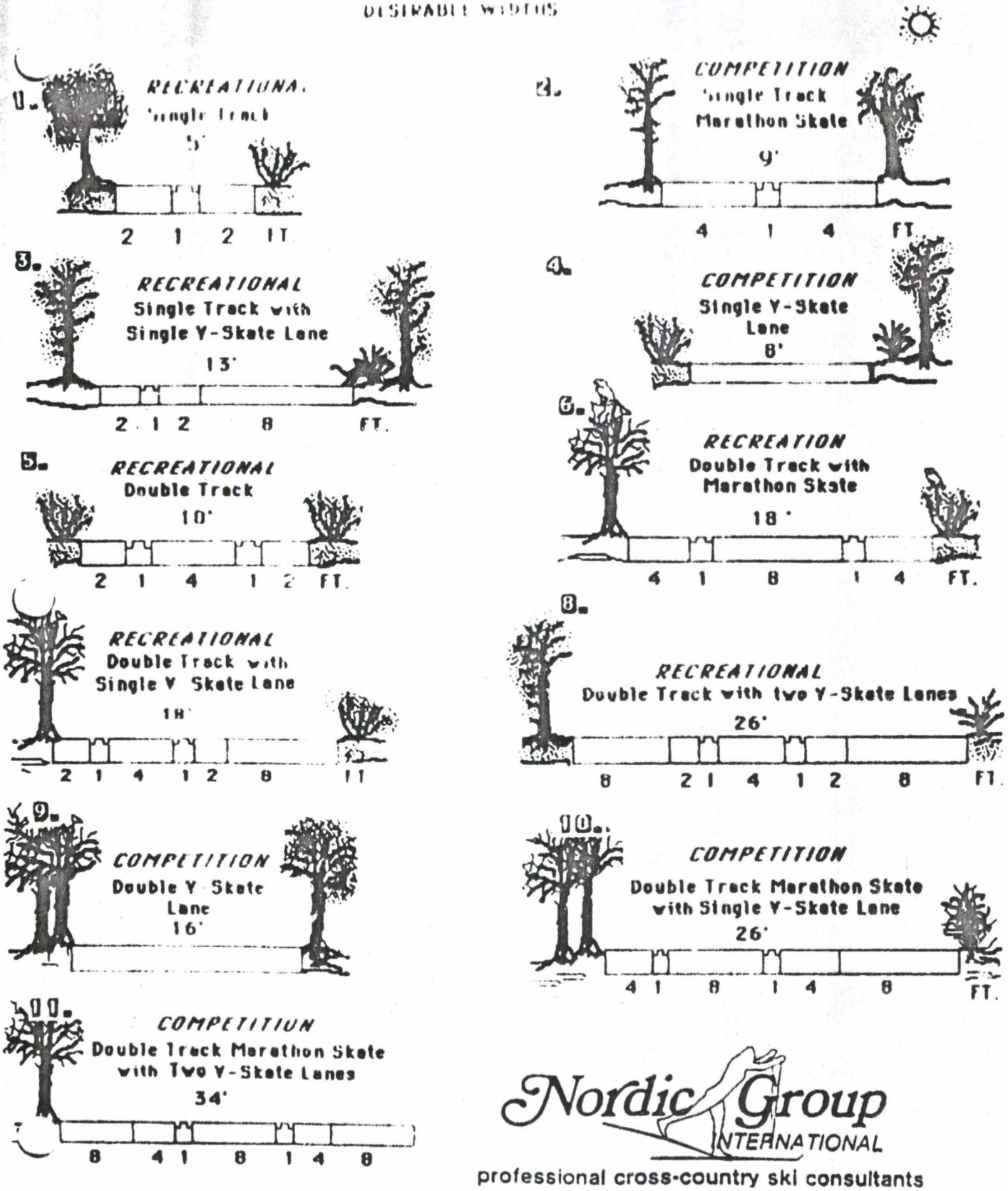


FIGURE 11

The minimum width of a groomed ski trail with a single set of trails is five feet. This allows for a packed surface two feet on either side of the track and one foot for setting the trail itself. A recreational trail with a double track requires ten feet in width. (See figure 12). If a trail is going to be used for competitive racing the widths will increase to allow for marathon skating. A

CROSS COUNTRY TRACK SETTING OPTIONS

DESIRABLE WIDTHS



Nordic Group INTERNATIONAL

professional cross-country ski consultants

FIGURE 12

single track competition ski trail will have to be nine feet wide and a double track will have to be eighteen feet wide. (See figure 12).

Note: The minimum width of the ski trail is also a function of the width of the grooming equipment used. If a snowmobile pulling a track sled is used a trail five feet wide is possible. If larger snow cats are used the width of the trail (at least the vegetative clearing) may have to be larger to allow passage and maneuvering of the equipment.

B. Ski Skating Trails - Ski skating is oriented towards exercise, speed, and technical ability. Ski skating trails are relatively flat and limited to slopes less than 12 percent, since a person cannot physically skate up steep hills. The trails require a flat surface in cross section with no tracks. Skating tends to ruin regular tracks rather quickly if done on the same trail. Therefore, separate skating lanes are now being developed along side of the traditional tracks to allow for skating. Skating lanes are eight feet wide and when combined with set tracks require a minimum of 13 feet and 18 feet depending on whether a single or double set of trails are set. (See figure 12).

Set Rental and Retail Sale Facilities - Ski rental and retail sales of ski equipment and accessories were developed at cross country ski areas for two reasons. The first reason is economics. This service simply adds an income source to an operator of a trail system to make the business more sound (Wiesel, 1982). Ski rental and retail sales also brings more people into cross country skiing by providing a way for people to try the activity without purchasing the equipment before hand.

Persons participating in cross country skiing want that service provided. People surveyed in Arizona indicated that they favored providing ski rental by a margin of 2:1. Also, ski rental and retail sales was favored most strongly over several other services rated (Kramer, 1983). In another similar study, Montana residents indicated they desired ski rental and retail sales be provided at areas developed for cross country skiing.(Meyer, 1982)

Krammer,in his paper on cross country ski touring centers, interviewed owners of several ski rental businesses to determine what was needed in order to have a successful rental business. Based on those interviews Kramer determined the following:

1. Waxless touring type cross country skis were favored by most of the businesses for ski rentals.
2. In order to supply the demand on weekends and holidays the businesses needed 80-90 pairs of skis.
3. The businesses needed approximately 30 percent more boots than skis.
4. One of the businesses also had a limited supply of mountaineering /telemarking skis with metal edges. He was successful at renting those to skiers that wanted to practice telemarking or to use them for ski mountaineering purposes.
5. Besides ski rentals some of the businesses rent gaitors, day packs, and other miscellaneous equipment as well as selling those items.
6. Two of the businesses take reservations for ski rentals.

Ski School - Providing ski lessons is another service that could be added to generate income and bring new skiers into the activity. There is a demand for this service. Meyer in his paper, through questionaires and public workshops,

determined that certified ski instructors and an organized ski school for all levels of skiers was desired by Montana skiers. Kramer, through questionaires of Arizona skiers, determined that the respondents favored providing ski lessons at a touring center by a 2:1 margin.

Kramer determined that an operator of a touring center should offer as a minimum a two-hour lesson for $8 and offer a combination two-hour lesson and a 2-1/2 hour tour for $18.

Jon Wiesel states (1985) that well run touring centers providing ski lessons are generating one lesson from every four to five visitors. If a cross country ski area generated 10,000 skier visits, the ski school at $8 per lesson, has the potential to generate $16,000 in gross revenue.

Ski Patrol - Ski patrols have been added at developed cross country ski areas for the same reasons as alpine ski areas have added the service. Although cross country skiing is safer than alpine skiing, accidents do happen. One of the ski patrol's functions is to give first aid and evacuate people if necessary. The ski patrol also ensures signs are in place, checks for safety hazards, conducts searches for lost skiers, and checks to see if people have paid the track fees.

Food Service - Providing food service is another element that provides an income source for an operator and provides a service to make the skiing experience more desirable.

Food service facilities range from a small snack bar type operation to elaborate eating facilities depending on the type area. Food service facilities not only provide a place to eat, but provide a place indoors to get warm and rest before continuing skiing. Providing some sort of food service is

almost mandatory at developed touring centers in order for it to be successful.

Lodging/Overnight Accommodations- As cross country skiing deversifies and services such as groomed trails, food service, ski rentals, and so forth are being provided, the next logical step is to provide overnight accommodations. The following types of commercial operations indicate types of cross country ski areas with overnight accomodations (wiesel, 1985):

1. Guest or dude ranches with overnight accommodations provide developed touring centers to bring in multi season use.
2. Lodges and hotels such as the White House (VT), and the Grand Traverse Hilton (Mi), provide cross country skiing to expand winter business.
3. Tourist communities such as Jackson (NH), the Methow Valley (WA), Frisco (CO), and increasingly Sun Valley and Jackson Hole are highly dependent upon tourist dollars for survival. Therefore, the towns are sponsoring touring centers to increase tourist visitation to the town.
4. Developed alpine ski resorts are developing cross country skiing to increase clientele at the resorts.

There are, however, successful independent cross country ski areas being developed, for example Royal Gorge in California, where overnight accommodations have been added to support the cross country operation rather than vice versa.

Overnight accommodations are also being provided in back country areas where a person skis to them, stays overnight, and skis out again. Royal Gorge Touring Center has a successful wilderness lodge program requiring a person to ski 2-1/2 miles to get to the lodge. It was a 60-year old structure built for

summer use that was improved to use in the winter. The lodge has a hot tub and sauna, has no showers, and sleeping is dormitory style; but it has a 35 percent return rate (Wiesel, 1985). Brighton Touring Center and others have developed "Yurt" systems where people ski to them, stay overnight, take advantage of excellent powder skiing, and ski back out. As cross country skiers increase in ability, this use will become more popular.

Guided Tours - Many cross country ski areas offer guided tours. This service again is to generate income for the operator and to offer additional recreation activities to draw people to the area. There are several different types of tours being offered:

1. Short tours associated with ski lessons. Kramer in his paper suggested as a minimum that concessionaires operating touring centers should offer a two hour lesson followed by a 2-1/2 hour guided tour.
2. Moonlight tours. Mormon Lake Touring Center in Arizona offers moonlight tours as part of their program and it has been successful (Kramer, 1983).
3. Wilderness/back country tours. This type tour is associated with advanced/expert skiers. This type tour can be one day but is usually a multi-day tour. Many of these tours offer "huts" or "yurts" for overnight accommodations where persons ski from hut to hut and stay overnight. However, some specialty tours, especially in wilderness areas, require camping equipment be carried with them and persons winter camp.

OPERATION OF CROSS COUNTRY SKI TOURING CENTERS

Current nordic market expansion seems to be track oriented; and real growth in

skiing is not at public parks where municipalities provide minimal services and poor track, but, at commercial cross country ski areas (Wiesel, 1985). Hollyburn Cross Country Ski Area in Canada had approximately 65,000 skier visits in its first year of operation and outgrew its parent alpine area in skier visits. Royal Gorge Cross Country Ski Resort, which started in 1972 with 67 skier visits, saw 70 000 visits in 1985, in a mediocre snow year.

The future of cross country skiing lies in its stature as a resort sport (Wiesel, 1985). The successful cross country ski areas look like and act like alpine ski resorts. The areas are offering high quality facilities and services including extensive grooming and marking of trails, excellent restaurants and lodging, intense marketing techniques and full color brochures. In the January 1987 issue of Ski Area Management Magazine, John Frado reports on the National Cross Country Design Symposium and states the following:

1. Eighty-five percent of the cross country ski market is primarily recreational versus competetive racing.
2. Social opportunity, enjoyable trails, and quality services are becoming more important motivational factors over physical fitness and the low cost of skiing.
3. With the gradual aging of the overall population and a gradual increase in the average age of participants, cross country ski area operators need to address the needs of older skiers and study the implications of an aging population.

Jon Wiesel in a paper delivered at the National Ski Areas Association Convention (May, 1985, p. 8), made the following predictions for cross country skiing for the year 1990:

1. Ninety percent of all nordic gear sold will be track oriented.

2. Cross country skiing will have out stripped downhill skiing in number of participants, though not in dollars generated.

3. Every alpine area able to do so will have a cross country affiliate.

Types of Cross Country Ski Touring Centers - There are at least eight distinct kinds of areas, in terms of affiliation and reasons for existence, some of which apply directly tc alpine ski areas. Additionally, there are trail systems and minimal accompanying services offered by such agencies as the National Forests and National Park systems, states, and municipalities. Among the commercial types are (Wiesel, 1985, p. 13-14):

1. Independent cross country areas, frequently winter only businesses.

2. Guest ranches, largely a western phenomenon and sometimes extremely successful such as Lone Mountain Ranch in Montana, use cross country skiing to develop multi-season interest among clients.

3. Golf clubs, intending to build supplemental income through winter activities. Numbers of these are affiliated with alpine ski resorts as at Aspen, Snowmass, or Stratton Mountain.

4. Lodges and hotels such as the White House (VT), and Grand Traverse Hilton (MI), tend to have strong three-season business but want to expand amenity packages in winter with cross country as the natural focus.

5. Communities such as Jackson (WN); the Methow Valley (WA); Frisco (CO); and increasingly Sun Valley and Jackson Hole. Here cross country can serve as anything from a supplement to downhill skiing to the key to a town's winter survival. Some are already distinct successes.

6. Corporations including Southern California Edison, Northeast Utilities and Molson Ale (Ontario). Frequently public relations plays a

greater role than the profit motive, as many have agreements with federal agencies to provide low cost public recreation.

7. Real estate developments, some of them large projects. They need a conspicuous, scenic, relatively inexpensive outdoor amenity to provide on-site recreation attractive to a wide spectrum of the buying public. Serving much the same function as a golf course, cross country helps create a winter selling season while running at operational break-even. Examples include Trapp Family Lodge (VT), Horseshoe Valley Resort (Ontario), and several projects in Jackson Hole.

8. Numerous alpine ski areas in the U.S. and Canada with cross country facilities. Among the more successful are Mt. Bachelor, Beaver Creek, and Waterville Valley. There are also combinations of affiliations such as alpine/real estate/hotel/golf course.

Facilities and Services Provided by Cross Country Ski Touring Centers - Successful touring centers all provide the same basic facilities and services. These are set track trails with groomed skating lanes serving at least beginner and intermediate terrain; ski rentals with at least touring type skis; ski lessons for all levels of skiers; and some type of food service/lodge facility either at the center or nearby. In addition, most areas offer guided tours; most either have overnight accommodations at the site or nearby; and depending upon the length of trails and complexity of the areas, most provide ski patrols.

The following is a comparison of several commercial cross country touring centers in the intermountain west. The information was obtained through

telephone interviews with the owners/managers of the centers and illustrates the facilities/services that are needed to successfully operate a touring center.

BRIGHTON TOURING CENTER
SALT LAKE CITY, UTAH

Track

Trail Length	15 kilometers
Difficulty	20% easiest 70% more difficult 10% most difficult
Fees	$4.50 per day $3.50 half day Persons 12 and under ski free
Type	Groomed trails with double track and skating lane where trail width is adequate; single track and a skating lane where trail width is narrow.
Grooming equipment	They use a Thikol 2100 snow cat to pack and renovate the trail and a Ski Doo Alpine Snowmobile with track setter to set the track.

Note: The manager of the touring center stated that the difficulty level to be optimum should be:

30 - 40% easiest
45% more difficult
15% most difficult

The manager also stated that ski skating has created problems for him. In the area where beginning skiers ski, the skaters tended to intimidate them because of the speed. Therefore, it is good to separate the ski skaters from the beginning track skiers if possible. Also, since some of their trails were not wide enough to provide a double set of tracks and a skating lane they set a single track plus a skating lane. This caused a congestion problem on the track portion since only approximately 15 percent of the skiers are ski skaters.

Ski Rental & Retail Sales

Total number of skis/poles	90 pair
Touring waxless skis	$8 full day and $6 half day
Telemark/mountaineering skis	$12 full day
Retail sales	The touring center sells ski equipment, clothing, gloves & miscellaneous accessories.

Ski Lessons

beginner, intermediate, expert, & telemark group lessons	$14 each person for 1-1/2 - 2 hours (offered scheduled group lessons for

	beginner/intermediate skiers 1 - 2 times per week; expert and telemark lessons scheduled as needed).
private lessons	$20 per hour

Note: Profitability came with ski lessons after they started soliciting large group lessons from high schools, colleges, and organized groups.

Ski Patrol

The center has a paid and volunteer ski patrol. The minimum staffing level is one paid patrolmen on weekdays and two patrolmen on weekends and holidays (one paid). They schedule one paid/one volunteer during the week, and two paid/two volunteer on weekends and holidays. In order to get good volunteers they offer a free season track pass as incentive.

Guided Tours

Yurt tour	Two days/one night - $225 each person and includes lodging, meals, ski guide, and transportation. Three day/two nights -$325 each person and includes the same.
Specialty tours	They do conduct other day tours as requested.

Note: The yurt and specialty tours are not profitable at present, because they have not been actively marketed. The manager stated that if they developed a more consistent business through marketing that the tours could be profitable.

Food Service & Lodging

There is a sitdown cafe at the touring center where you can get hamburgers, sandwiches, etc. There is also food service and a limited amount of lodging available at nearby Brighton Alpine Ski Area

Profitability

The center covers the cost of providing the trail system, the ski lessons, and the yurt tours and make a minor profit on these services. The center is making profits on ski rentals, retail sales, and food service.

WHITE PINE TOURING
PARK CITY, UTAH

Track

Total length	9 kilometers (the trails are located on a golf course at Park City)
Difficulty	50% easiest 50% more difficult
Fees	$2/day $35 season pass
Type	Groomed trails with double track and a skating line provided on all 9K

Grooming equipment — Ski Doo Alpine Snowmobile with a homemade grader bar and track setter.

Note: The manager of the center stated that for a destination type resort 10K of track are minimum, 20K is better and 30K would be good to provide the variety needed.

Ski Rental & Sales

Total number skis/poles	80 pair + 20% more boots	
Touring waxless	$8 full day	$6 half day
Skating skis	$8 full day	$6 half day
Telemark/mountaineering	$12 full day	$10 half day

Note: The majority of rental skis, equipment were the waxless touring skis and associated boots and poles.

Retail sales — The center sells ski equipment clothing, and accessories and is the only shop at Park City selling cross country equipment.

Ski Lessons

Beginner group (offered twice daily)	$11 each for 1-1/2 hours
Basic downhill (emphasis on control)	$11 each for 1-1/2 hours
Private lessons	$20 per hour
Telemark lessons	$20 for 2 hours; these lessons are given at Park City West Ski Area and does not include the cost of a lift pass.

Ski Patrol

None

Guided Tours

Day tours — The center offers various day tours in the Park City area.
Half day tour - 12:30-4:00; $22 each person and includes guide and transportation
Full day tour - 10:00-4:00; $35 each person and includes guide, transportation and lunch.

3-5 day tours — The center offers 3-5 day tours; the cost is $60 per person per day and includes the guide, transportation and accommodations at Boy Scout cabins.

Food Service & Lodging

There are numerous restaurants, snackbars and accommodations offered in the Park City area.

Profitability

The center basically breaks even on all services offered except ski rental. Since the center is the only one at Park City the profits are derived mainly from ski rentals and retail sales.

KARHU TOURING CENTER
TETON VILLAGE, WYOMING

Track

Total length	15 kilometers
Difficulty	50% easiest 25% more difficult 25% most difficult
Fees	$6 full day $4 half day
Type	They offer groomed trails with a double set of tracks and a skating lane.
Grooming equipment-	Piston Bully snow cat with a renovator and tracksetter.

Note: The manager of the touring center stated that in order to have an excellent destination type touring center that you really need 30-40 kilometers of track in order to have enough variety of trails to keep customers interested.

Ski Rental & Retail Sales

Total number skis/poles 75 pair

Touring waxless skis -	$9 full day	$6.50 half day
Telemark/mountaineering skis -	$12 full day	$8 half day
Racing skis -	$12 full day	$8 half day
Skating skis -	$12 full day	$8 half day

Retail Sales — The touring center sells skis and ski equipment as well as clothing, gloves, and misc. items.

Note: The manager of the center stated that you need approximately 20-30 percent more ski boots than skis and poles in order to have adequate sizes. He also stated that the majority of rental skis were the touring waxless type.

Ski Lessons

Beginning track	$13 ea. for 1 hour/1 person $13 ea. for 1-1/2 hours/2 persons $13 ea. for 2 hours/3 or more persons
Telemark lessons	$15 ea. for 1 hour/1 person $15 ea. for 1-1/2 hours/2 persons $15 ea. for 2 hour/3 or more persons
Private lessons	$26 hour; $8 ea. additional hour
Special package	$19 includes a ski lesson, rental of equipment and a trail pass.

Guided Tours

Day Tours	The center offers several day tours in the area. They charge $27 for each person and that includes transportation and a guide.
Hot Springs Tour	They offer a day tour to a Hot Springs in the area. This tour costs $50 per person with the same services offered.

Note: The manager stated it takes four people per tour for the center to break even on cost.

Food Service & Lodging

The center is part of Teton Village ski resort. There are many restaurants, snackbars, etc. at the resort to accommodate guests and lodging is available through the resort.

Ski Patrol

The center has a ski patrol to take care of accidents and control use.

Profitability

The manager stated that all services offered were making a profit.

TOGWOTTEE LODGE TOURING CENTER
JACKSON, WYOMING

Track

Total length	20 kilometers
Difficulty	1/3 easiest 1/3 more difficult 1/3 most difficult
Fees	$4 full day adult $2 full day children $2.50 half day adult $1.50 half day children
Type	Groomed trails with a single track set and a skating lane.
Grooming equipment	DMC track truck with renovator/tracksetter

Ski Rental & Retail Sales

Total number skis/poles	50 pair
Type equip. & fees	General touring waxless skis - $8.50 full day $5.50 half day (solomon system bindings/boots) Telemark/mountaineering skis - $10.50 full day $7.50 half day
Retail sales	The center sells skis and ski equipment plus miscellaneous clothing accessories.

Ski Lessons

Beginner group	$9 for 1-1/2 hour
Intermediate track group	$11 for 1-1/2 hour
Telemark	$13 for 1-1/2 hour
Private	$18 for 1st hour; $5/hour for additional

Note: The price of the lessons includes the daily track fee.

Guided Tours

Day tours	The center offers day tours for $25 per person to various locations in the area. The cost includes the guide and transportation only.
Lodge guests	If the guests in the lodge are staying for three or more nights the center offers tours free of charge.

Ski Patrol

None

Food Service & Lodging

The lodge offers food service and overnight accommodations.

Profitability

The person interviewed stated that the track fee basically covered the costs of grooming and making the trails available and that there was not much market in their retail sales. The main profit areas are in ski rentals and ski lessons plus the food service and accommodations the lodge provided.

Cross Country Touring Centers at Alpine Ski Resorts - Alpine ski resorts are in a very good position to capitalize on the growing cross country skiing market. Many of the support services and facilities needed for a successful operation are already in place at Alpine ski resorts. Parking areas, structures, high quality food service and lodging are already provided at alpine areas, plus having staff that is experienced in management, marketing, cost control, ski school, permits, and other facets of operations that are very similar to cross country ski areas. Alpine areas already are doing extensive grooming and have grooming equipment. With little training and small amount of new equipment trail grooming and track setting can be in operation.

If there is suitable terrain available at an alpine area plus room to expand base area facilities, cross country skiing can be advantageous to an alpine operator if well planned and integrated into the resort. Alpine resorts are already oriented to providing quality experiences to alpine skiers so if the same concepts are applied to the cross country operations it can do the following for alpine operators (Wiesel, 1985, p. 19):

1. Help create client loyalty;
2. Create and hold new markets;
3. Help retain or build Alpine market share and number of skier visits;
4. Increase revenue sources and profits;
5. Enhance revenue/skier;
6. Help sell real estate, meals, lodging and the other sources of income not directly skiing-related;
7. Develop a greater balance of winter recreation at moderate cost that will not conflict with other amenities;
8. Reinforce media recognition of your individual site and of the attractions of your skiing mix.

SUMMARY

Cross country skiing, which was the original form of skiing, began in the U.S. during the "gold rush" days of the 1800's. However, Alpine skiing with tows and lifts dominated the sport of skiing in the U.S. until very recently. Cross country skiing didn't begin a resurgence until the mid to late 1960's, about the same time as the environmental movement. Since then, the sport has grown rapidly from a few thousand hardy young male skiers breaking trail in the backwoods to an activity serving 6-7 million skiers in 1983 (probably close to 10 million now). The activity has also gone through a rapid evolution from skiing in undeveloped areas and no trails to sophisticated cross country resorts with groomed trails serving old and young alike with half male, half female participation.

Cross country skiing has evolved into several distinct types which, although similar, are different in terms of environment, amount of development, facilities required, and experience desired. These types are ski touring off

track, ski touring groomed track, ski mountaineering, telemarking, ski skating, ski racing, ski biathalon, and ski jumping.

Persons are motivated to cross country ski for a variety of reasons including experiencing nature, physical exercise, technical achievement, social contact, escaping the pressures of civilization, lower cost than Alpine skiing, relatively safe, and it is a good family activity. Again, it is important to recognize that the different skier types are motivated to participate for different reasons and want different recreation experiences.

There are certain basic facilities that are needed in order for people to participate in cross country skiing. Plowed access, parking, and sanitation facilities are the most basic. Many other facilities have been added to these as the activity evolved to provide for skier safety and skier convenience. Ski trails have been developed, cleared, and signed and shelters and rest areas have been added. Some trails are now packed and groomed with set tracks and ski skating lanes. As cross country skiing evolved commercial cross country ski touring centers were developed. These touring centers offer ski lessons, a ski patrol, ski rental and retail sales, guided tours, food service, and overnight accommodations.

It appears that a large portion of the growth in cross country skiing is taking place at commercial cross country touring centers and it appears that the people using the centers want quality services, social contact, and enjoyable trails. Several different types of touring centers are being developed, most of which are additions to an existing commercial operation. Cross country skiing provides another recreation activity or an additional amenity to the commercial operation. Independent commercial touring centers are also being developed and some on a large scale. We now see some developed cross country

ski destination resorts patterned after alpine ski resorts.

Successful commercial cross country ski areas offer, as a minimum, groomed trails with set tracks and skating lanes, ski rental and retail sales, ski lessons, and food service. Most of these commercial touring centers also offer guided tours, have a ski patrol, and have overnight accommodations at the area or nearby. Although, not all of the services are generating profits, significant revenues can be generated at the areas. Many areas are charging track fees in the $6 - $9 range and well run areas are generating one ski lesson from every 4-5 visitors. One particular area generated revenues at $17.04 per skier visit exclusive of food, bar, and lodging with a track fee of only $3.50. A cross country skier community in New Hampshire generated $24.90 per skier visit on track fees, lessons, meals, and lodging, but excluding groceries, gasoline, and liquor purchases (Wiesel, 1985, p. 10).

Alpine ski resorts are in a unique position, if suitable terrain exists, to provide commercial cross country skiing. Alpine areas already have parking areas, food service, lodging, grooming equipment and buildings. They have staff expertise in marketing, ski school, ski patrol, management, and cost control. Alpine areas already have a captive audience that in many cases are looking for an additional recreational activity to participate in.

Cross country skiing has definitely evolved into a many faceted recreational activity. Recreation planners must be aware of the skier types and skier experiences if successful planning is to be accomplished for cross country skiing.

CHAPTER III

CROSS COUNTRY SKI MASTER PLAN DEVELOPMENT

This chapter will utilize the information developed in Chapter II to develop the final master plan for cross country skiing at Snowbasin. The objective of the master plan will be to provide cross country skiing opportunities for as many of the skier types as possible, including the historic users.

Four planning steps will be completed in order to develop the master plan. These steps are as follows:

1. Develop a cross country skier opportunity spectrum.
2. Analyze the study area for suitable ski terrain.
3. Complete a functional analysis of the different cross country skiing components.
4. Develop the master plan.

CROSS COUNTRY SKIING OPPORTUNITY SPECTRUM

Cross country skiing has rapidly evolved into several distinct types of skiers, each with their own motivations and needs. In order to adequately plan opportunities to satisfy those needs, a classification system is needed which identifies parameters specific to each type.

In analyzing cross country skier types, a spectrum exists similar to the Recreation Opportunity Spectrum now used for recreation planning. This spectrum ranges from persons wanting a primitive/natural environment experience to persons wanting a recreation experience in a highly modified, controlled environment. This spectrum can be defined based on motivation and recreation

experience desired, the setting in which the experience takes place, and the level and type of developed facilities desired. Based on the information reviewed in Chapter II, the following Cross Country Skier Opportunity Spectrum was developed.

CROSS COUNTRY SKIING OPPORTUNITY

	SKI MOUNTAINEERING	SKI TOURING (OFF TRACK)	TELEMARK SKIING	SKI TOURI
MOTIVATION & RECREATION EXPERIENCE	Ski mountaineers seek the challenge & skill of ascending/decending steep mountainous areas. They are motivated by the opportunity to experience achievement, technical accomplishment, escaping psychological & civilization pressures, and experiencing nature and & solitude. Excitement, challenge, thrill, adventure, and danger are important to this type. Ski mountaineering includes wilderness skiing, winter camping, winter mountain climbing.	ski tourers (off track) are seeking to experience nature in a winter environment. They are motivated by the opportunity to experience nature, solitude, escape from psychological & civilizations pressures and, to some degree, are motivated by keeping physically fit and low cost of participation. They ski in small groups 2-4 people and viewing scenery, viewing wildlife, and interacting with nature are important.	Telemark skiers are seeking the challenge & skill of mastering a technique. They are motivated by the opportunity to experience achievement, technical accomplishment, social contact, and exercise. This skier will ski at developed Alpine ski areas or more open natural areas. As this skier increases in skill level and moves toward natural areas their motivation changes toward that of ski mountaineering.	Ski toure groomed t recreatio ed, contr environme by the op social co technical activity participa injury oc tunity fo physicall and expec developed is a more tend to b higher de action is with othe
SETTING	The setting is generally characterized by essentially unmodified natural environment usually of fairly large size. Interaction with other humans outside of the immediate group is minimal. The setting should offer a high degree of challenge that will test the skiers ability, i.e. high peaks, steep mountainous terrain. Facility development is nonexistent except for access and parking and any additional should be done only to facilitate the use.	This setting is generally characterized by a predominately natural environment moderate to large in scale. Interaction with other humans is low, but evidence of other humans may be present. A minimum of on site controls and restrictions is desireable. Facility development should be minimal and done so that they harmonize with the natural environment. Facilities should be developed only to facilitate the use and provide a safe experience.	The setting ranges from a highly developed Alpine Ski area to areas that are predominately natural. Interaction with other humans can be high. Facilities for user convenience are acceptable and desired in many cases.	The setti substanti Interacti common ar Developed convenien able and accommoda
FACILITY AND SERVICES PROVIDED	Facilities should only be provided to make participation possible and to be of the smallest scale possible. Suggested facilities include: -plowed access road -plowed parking area -sanitation facility at the parking area	Facilities should be provided to make participation possible and for user safety. Small scale facilities for user convenience may may be provided as long as they harmonize with the natural environment and are not overly obtrusive. Suggested facilities include: -plowed access road -plowed parking areas -sanitation facilities at the parking area and possibly provided on longer trails -cleared ski trails with trail signs and route markers -natural or natural appearing shelters and rest areas provided on longer trails.	Facilities and services are provided to make participation possible and to provide for user convenience. Suggested facilities include: -plowed access road -plowed parking area -sanitation facilities at the parking area and possibly located in areas where concentrated use exists. -possibly clear & sign routes to areas popular for telemarking. -shelters and rest areas could be developed in areas of concentrated use. -if telemarking is done at a cross country ski area or alpine ski area then services such as ski rental, ski lessons, food service, lodging, & guided tours should be provided.	Facilitie vided to possible, convenien services -plowed -sanitat parking on long -groomed -high le trail n of diff -additio identif -rest ar long tr -cross c with sk lessons -guided exist i -if the destina -accommo

COUNTRY SKIING OPPORTUNITY SPECTRUM

TELEMARK SKIING	SKI TOURING (SET TRACK)	SKI SKATING	COMPETITIVE CROSS COUNTRY SKIING
Telemark skiers are seeking the challenge & skill of mastering a technique. They are motivated by the opportunity to experience achievement, technical accomplishment, social contact, and exercise. This skier will ski at developed Alpine ski areas or more open natural areas. As this skier increases in skill level and moves toward natural areas their motivation changes toward that of ski mountaineering.	Ski tourers skiing on set track and groomed trails are seeking a winter recreation experience in a developed, controlled, more social environment. They are motivated by the opportunity to experience social contact, achievement and technical accomplishment, a winter activity the whole family can participate in, an activity with low injury occurrence, and an opportunity for exercise and keeping physically fit. These skiers want and expect user conveniences and developed facilities. Since this is a more social activity skiers tend to be in larger groups and higher densities. Social interaction is desirable and contact with other skiers is common.	Ski skaters are seeking the challenge & skill of learning a technique in a more developed environment. They are motivated by achievement and technical accomplishment, exercise and keeping physically fit, and social contact and experiences. The ski skater is interested in speed and endurance on a groomed trail by mastering the skating technique. Contact with other skiers is frequent and desireable.	Skiers participating in racing and jumping events are seeking the challenge & skill of mastering a technique at such a level to be able to be better than other skiers. They are motivated by technical accomplishment and achievement, and social contact and experiences. The affilliation and social contact with other individuals is important.
The setting ranges from a highly developed Alpine Ski area to areas that are predominately natural. Interaction with other humans can be high. Facilities for user convenience are acceptable and desired in many cases.	The setting is characterizd by a substantially modified environment. Interaction with other humans is common and desireable in more cases. Developed facilities for user convenience and safety are desireable and should be designed to accommodate fairly large groups.	Same as ski touring (set track)	The setting is characterized by a substantially modified enviroment. Interaction with other humans is desireable. Developed facilities should be provided for user convenience and safety, and designed to accommodate large groups. Special facilities may need to be provided to facilitate the event and provide for spectator viewing the event.
Facilities and services are provided to make participation possible and to provide for user convenience. Suggested facilities include: -plowed access road -plowed parking area -sanitation facilities at the parking area and possibly located in areas where concentrated use exists. -possibly clear & sign routes to areas popular for telemarking. -shelters and rest areas could be developed in areas of concentrated use. -if telemarking is done at a cross country ski area or alpine ski area then services such as ski rental, ski lessons, food service, lodging, & guided tours should be provided.	Facilities and services are provided to make participation possible, for safety, and for user convenience: Suggested facilities/ services include: -plowed access road & parking area -sanitation facilities at the parking area at various locations on longer trails. -groomed trails with set track -high level of signing including trail name, distance, & degree of difficulty -additional route markers to identify the trail -rest areas and shelters added on long trails -cross country ski touring center with ski rental, retail sales, ski lessons, and food service. -guided tours if suitable areas exist in the vicinity of the area -if the area is planned to be a destination resort then overnight -accommodations are needed.	Facilities and services for this type skiing are the same as for ski touring (set track) except that groomed skating lanes need to be added to the set track ski trails.	Facilities and services are the same as for ski touring (set track except that special features will have to be added for the particular competitive event. -set track trails and skating lanes will have to be developed to national/international racing standards. -If Ski Biathalon races are to be conducted areas along the trail will have to have target ranges. -If Ski Jumping is to be provided ski jumps and a jumping hill will have to be built to national/ international standards. -All competitive racing or jumping events will require additional parking to accommodate spectator spectator viewing areas, possibl additional sanitation facilities & food service, & misc. facilit to accommodate the event.

SKI TERRAIN SUITABILITY

The second step in the planning process is to analyze the physical components of the study area to determine suitable and unsuitable areas for cross country skiing. The physical components important in determining the suitability are: (1) percent slope, (2) aspect, (3) elevation (indication of snow depths), (4) historic use, (5) hazardous soils, and (6) vegetation patterns.

In order to efficiently and objectively analyze the 12,040 acre study area for suitability, a computer system was utilized. Beat Von Allman of Alpen Tech (ski area planning and engineering consultant) has developed a computer program combining many of the same physical components to develop alpine ski area suitability. He agreed to help with this study and through some minor software adjustments, we were able to utilize the program and use it to generate the physical component and cross country skiing suitability maps.

The input data for the program consisted of digitizing the elevations, the vegetation patterns, historic use patterns, and the hazardous soil areas and entering it in the computer. The computer program then calculates percent slope and aspect based on the input data.

PERCENT SLOPE

The percent slope varies considerably throughout the study area. The western side of the area is very steep with the majority of terrain in the greater than 40 percent slope category. The area adjacent to the mountain peaks is very steep with many slopes greater than 70 percent, and with many rock outcroppings and cliffs. The slopes are more gentle with a high percentage of slopes less than 20 percent in the area east of Snowbasin Ski Area. Illustration two is a

computer generated oblique view of the study area indicating percent slope. The slope classes in the illustration are in 10 percent increments.

This particular component is the most important factor in developing ski terrain suitability. Percent slope is the key factor in determining if areas can be skied or not and in determining the various skill level categories. Also, grooming equipment can only operate on slopes up to 30 - 40 percent. Anything steeper than that is marginal when considering groomed trails. Slopes less than 20 percent are the key areas for providing ski touring trails (both set track and off track). Ski touring trails steeper than 20 percent on a sustained grade are marginal.

For the purposes of developing ski terrain suitability, percent slope was broken into five categories, and the categories were weighted as to their importance. The slope classes are (1) less than 12 percent, (2) 13 -20 percent, (3) 21 - 30 percent, (4) 31 - 40 percent, and (5) greater than 40 percent. Twelve percent was chosen as a break point because that is the upper limit for ski skating and the upper limit for the beginning class skier. Twenty percent was considered as a break point for indicating good suitability for ski trails. The 20 - 40 percent categories indicate levels of marginal suitability and above 40 percent are considered as unsuitable. The following table indicates the slope classes, weights assigned, and acreages in each category.

SLOPE CLASS	WEIGHT	ACREAGE	PERCENT OF TOTAL ACREAGE
less than 12%	80	725.8	6.0%
13% - 20%	60	4302.5	35.7%
21% - 30%	10	3501.6	29.1%
31% - 40%	0	1968.5	16.4%
greater than 40%	-80	1539.7	12.8%

TABLE 5

Aspect

The solar aspect in the study area is generally east and north with small amounts that face south and west. The aspect component is important for maintaining snow quality and snow depths. The north aspects are most important because they receive very little direct sun and the east aspect would be next in importance. Illustration three indicates the various aspects within study area.

The following table indicates the various aspect categories, assigned weights and acreages by category that was used in the ski terrain suitability model:

ASPECT	WEIGHT	ACREAGE	% OF TOTAL ACREAGE
North	40	1617.1	13.4%
Northeast	40	2331.0	19.4%
Northwest	40	754.9	6.3%
East	30	3571.4	29.7%
Southeast	0	1327.8	11.1%
South	-50	954.4	7.9%
Southwest	-50	660.2	5.5%
West	-50	823.6	6.8%

TABLE 6

ELEVATION

The elevation within the study area ranges from 5,100 feet to 9,800 feet at Mt. Ogden. Elevation is important because as the elevation increases, snow depths increase, thus lengthening the ski season. Snow depth is not a problem within the study area. Even the lower elevations maintain 18 inches of snow from December to April in a normal year. However, the snow depth and snow quality are better above 6,000 feet in elevation.

The following table indicates the elevation categories, assigned weights, and

acreages by category that were used in the suitability model:

ELEVATION	WEIGHT	ACREAGE	% OF TOTAL ACREAGE
less than 5,500'	0	1267.0	10.5%
5,501' - 6,000'	10	4634.9	38.5%
6,001' - 6,500'	20	2802.3	23.3%
6,501' - 7,000'	20	1218.8	10.1%
gr. than 7,000'	20	2117.4	17.6%

TABLE 7

VEGETATION PATTERNS

There are five general vegetative patterns or types within the study area. These are (1) conifer (Douglas Fir/Alpine Fir), Quaking Aspen/Mountain Maple mix, (2) Gambles Oak/Mountain Maple mix, (3) Sagebrush/grass, (4) meadow areas, and (5) rock outcropping/brush. The vegetation types are important to cross country skiing for two reasons. The first reason is snow quality. Vegetation provides shade to the snow pack thus the snow quality remains high, (it keeps the snow from getting crusty or icy), and the snow will not melt as fast thus lengthening the season. The second reason is scenic quality. If the whole trail system is in the same vegetative type the views and the recreation experience would become very monotonous. However, if the skier is subjected to changing patterns of vegetation and changing views the experience is heightened. The overall vegetative patterns in the study area are highly varied even within the basic vegetation types identified and thus contributes to the overall high scenic quality within the study area. Illustration four indicates the locations of the various vegetation types in the study area.

The conifer, Aspen, and Maple were rated best for cross country skiing because it is the best type for maintaining snow quality and is the best aesthetically. The meadow type was rated the same because of its contribution

to aesthetics, the slope is relatively flat, and they require little vegetative clearing. The Oak/Maple mix and the Sagebrush grass types were considered lower in value than the previous two because they tend to be somewhat monotonous aesthetically and do not protect the snow quality as well. The rock outcropping brush type was considered negative in value because the areas are unsuitable for cross country skiing. Table eight lists the vegetative pattern types, the relative weights assigned to them, and the acreages of each type.

VEGETATION TYPE	WEIGHT	ACREAGE	% OF TOTAL ACREAGE
Conifer, Aspen Maple Mix	40	3583.6	29.8%
Meadow	40	153.1	1.3%
Oak/Maple Mix	20	5069.4	42.1%
Sagebrush/Grass	0	2248.5	18.7%
Rock Outcrop/Brush	-50	970.9	8.1%

TABLE 8

HAZARDOUS SOILS

Several areas within the study area have been identified as having hazardous soils. These are generally pockets of clay that have a high slumping or mass failure potential especially if disturbed by construction. One particular area, an ancient Paleo landslide (Bear Wallow Drainage), is located adjacent to the Snowbasin Ski Area base facilities. This area presently moves up to two feet per year and is highly unstable. Generally, soils are not constraining to cross country skiing; however, removing vegetation or disturbing these areas constructing ski trails may cause slumping or mass failure to occur. Illustration five indicates the areas of hazardous soils.

The soil types were rated based on how constraining they would be in developing cross country ski trails and facilities. Table nine was used in the

suitability model and indicates the level of constraint, the relative weights assigned and the acreages for each type. Note that only those areas of high or very high constraint would have a negative effect on suitability (red and purple colors on illustration five).

SOIL CONSTRAINT	WEIGHT	ACREAGE	% OF ACREAGE
No Constraint	0	9273.0	77%
Light Constraint	0	2081.1	17.3%
Medium Constraint	0	402.5	3.3%
High Constraint	-50	0.0	0.0%
Very High Constraint	-60	283.8	2.4%

TABLE 9

HISTORIC USE

There are several areas and routes used presently for ski touring. The most popular area is adjacent to the Snowbasin lower parking area north to Maples Campground. This includes one of the meadow areas identified under vegetation patterns. Other popular routes are (1) from Snowbasin Ski Area south to Green Pond, (2) from Highway 226 south and west up the East Fork of Wheeler Creek, (3) from Highway 226 west up the main fork of Wheeler Creek to Snowbasin Ski Area, and (4) a route south up the Middle Fork of Wheeler Creek. Illustration six indicates the areas of historic use.

If the areas are used now for cross country skiing then it is assumed they are suitable and should add to the overall suitability for cross country ski trails. Table ten indicates historic use, its assigned weight and the acreages now used:

HISTORIC USE	WEIGHT	ACREAGE	% OF ACREAGE
Historic Areas/Routes	50	394.0	3.3%

TABLE 10

CROSS COUNTRY SKI TERRAIN SUITABILITY

The cross country ski suitability model is simply an addition process with the weights assigned to the individual factors being the key component. The computer stores information in cells. The cell size is 100 feet by 100 feet and represents approximately one-fourth acre of the study area. For the individual physical components, the computer examines a particular cell and stores the weight for that factor in the cell. For example, if the percent slope of a particular cell is seven percent the computer stores a +80 in that cell. If the percent slope is 67% the computer stores a -80 in that cell. When the suitability model is run, the computer adds up all the weights stored for a particular cell and stores the total. The higher the score the higher the suitability. The best suitability then would be a cell that is less than 12 percent slope, on a north aspect, greater than 6,000 feet in elevation, in a conifer/Aspen/Maple vegetation type, is not constrained by soils, and is in an area that is presently used for cross country skiing. The score for that cell would be 230. The worst suitability would generate a score of -240.

There are eight suitability classes in the study area ranging from excellent to unsuitable. Illustration seven shows the cross country ski suitability for the study area. The study area overall has a relatively high suitability for cross country skiing with over 50 percent in the good to excellent categories.

PERCENT SLOPE

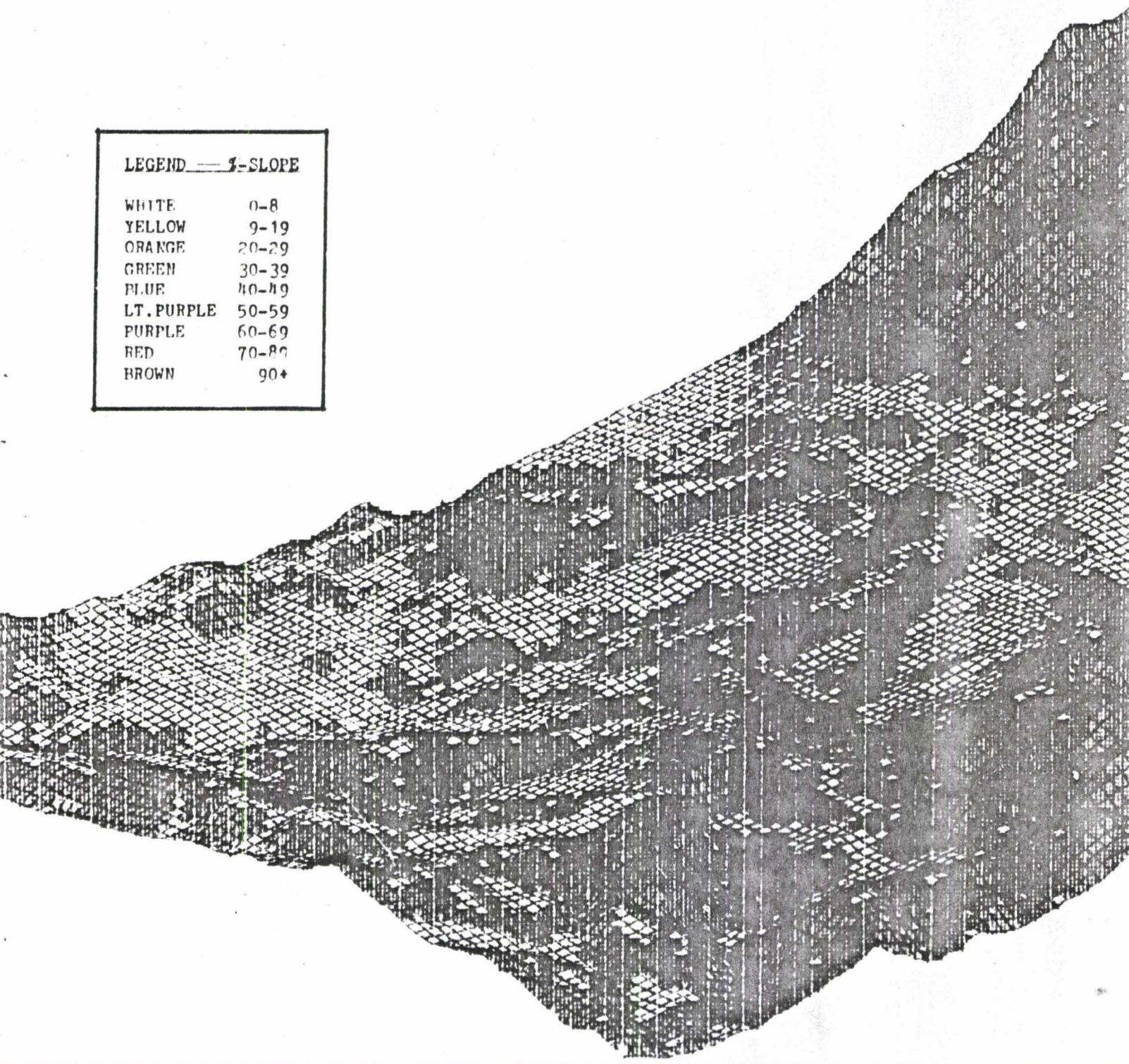


Illustration 2

DIRECTIONAL

ASPECT

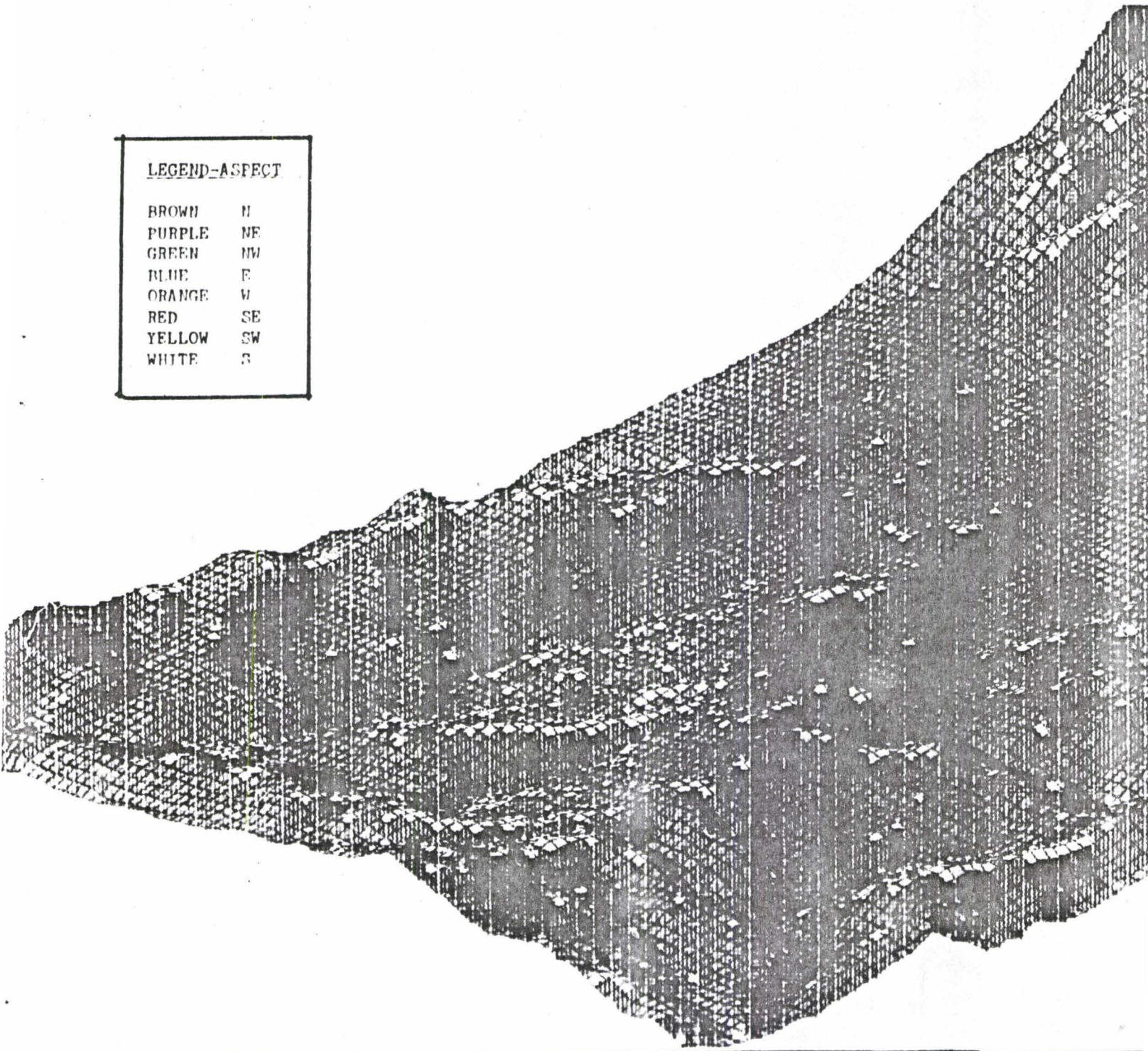


Illustration 3

VEGETATION

LEGEND-VEGETATION TYPES

GREEN	- CONIFER, ASPEN, MAPLE MIX
LIGHT GREEN	- MEADOW
GREY	- MAPLE - OAK MIX
YELLOW	- SAGEBRUSH - GRASS MIX
BLACK	- ROCK OUTCROP - BRUSH MIX

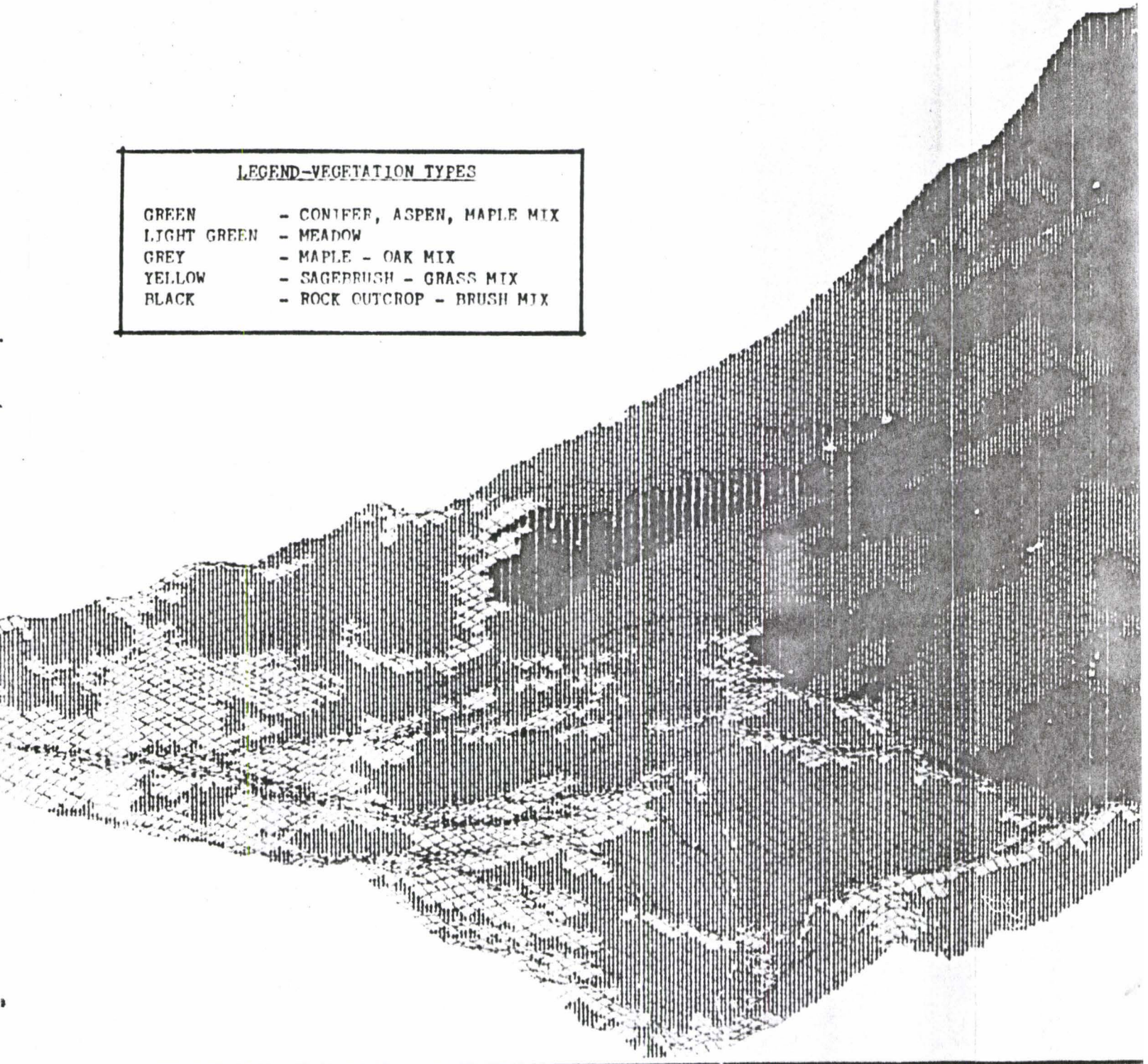
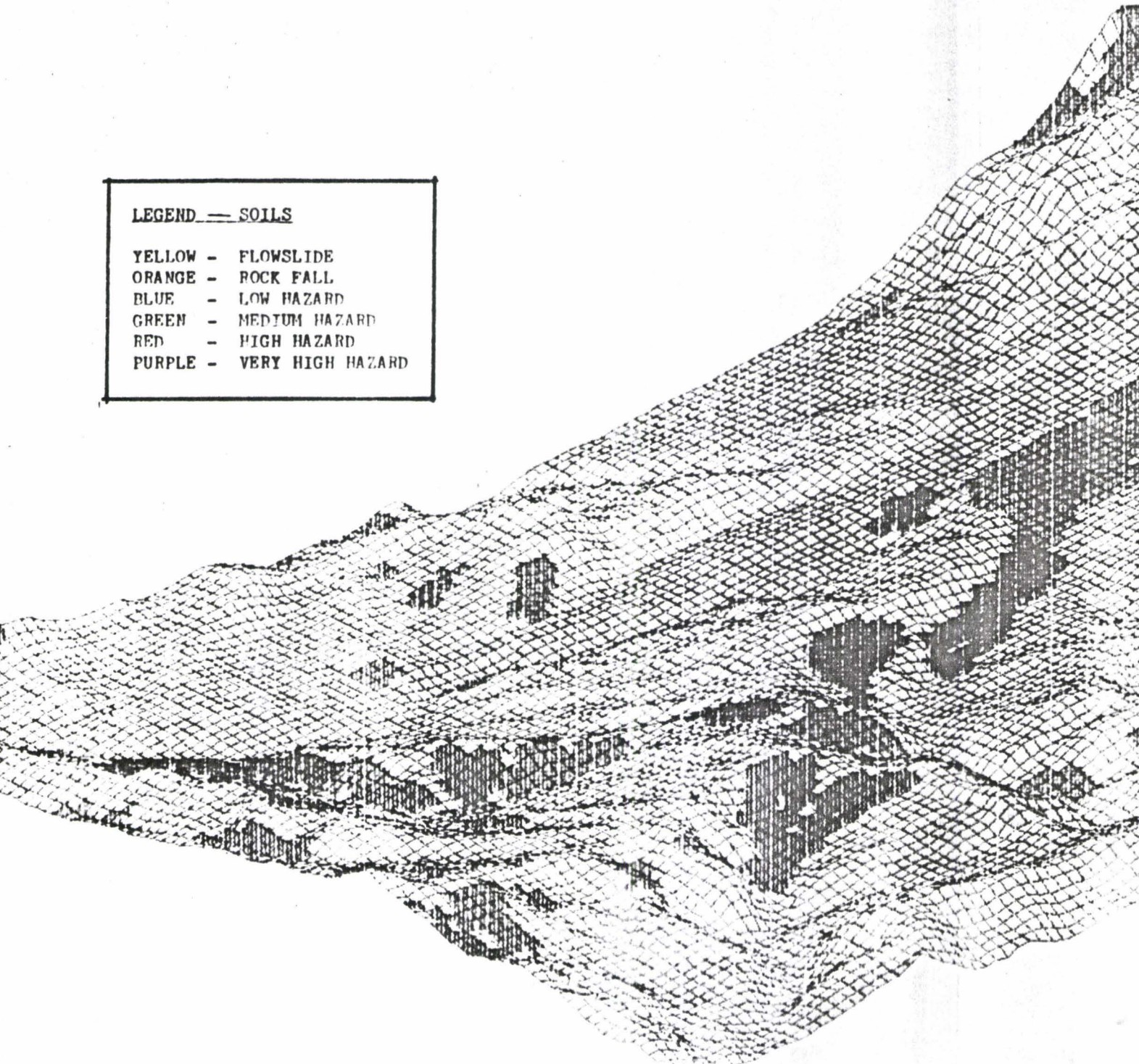


Illustration 4

HAZARDOUS SOILS



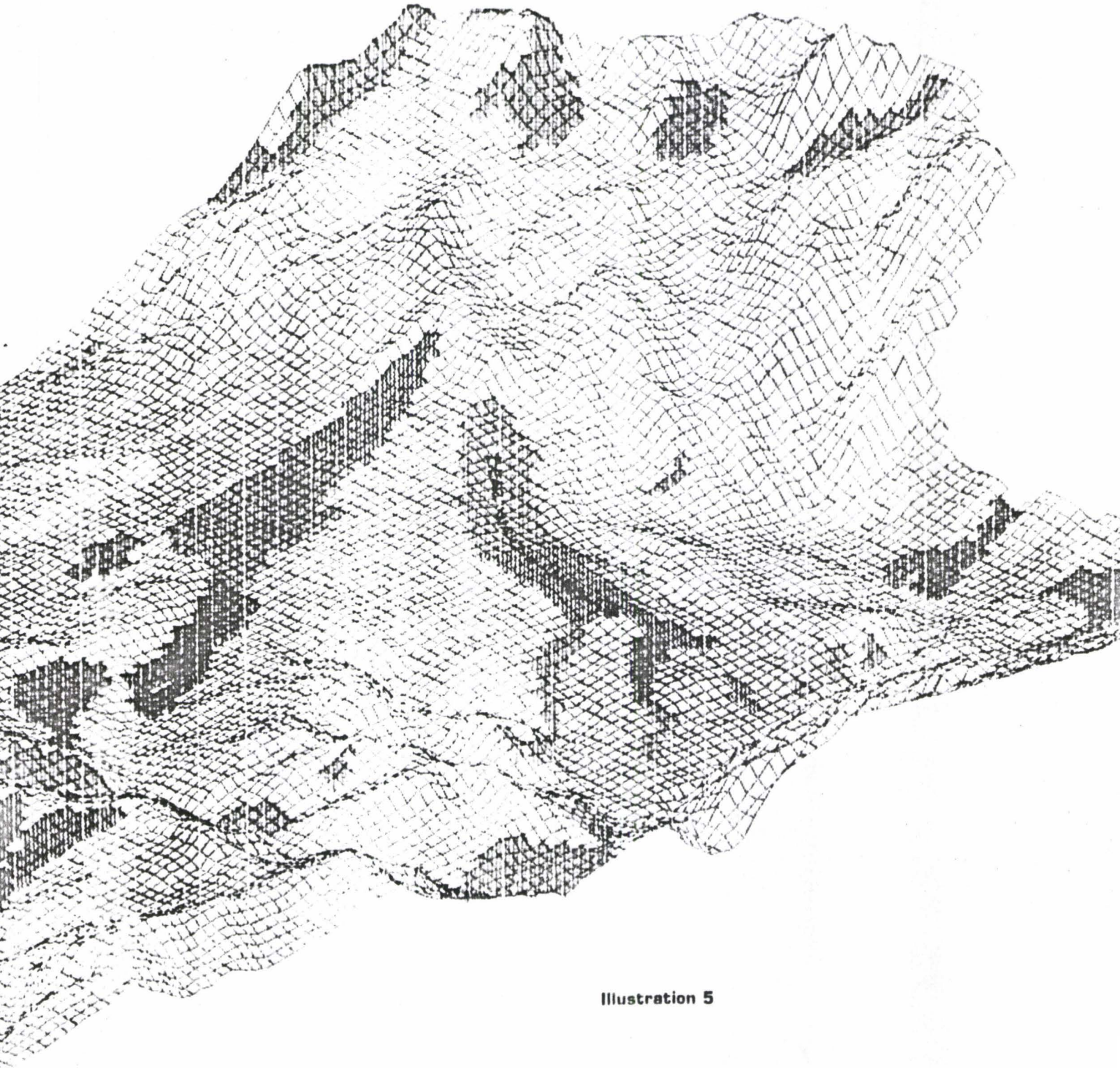
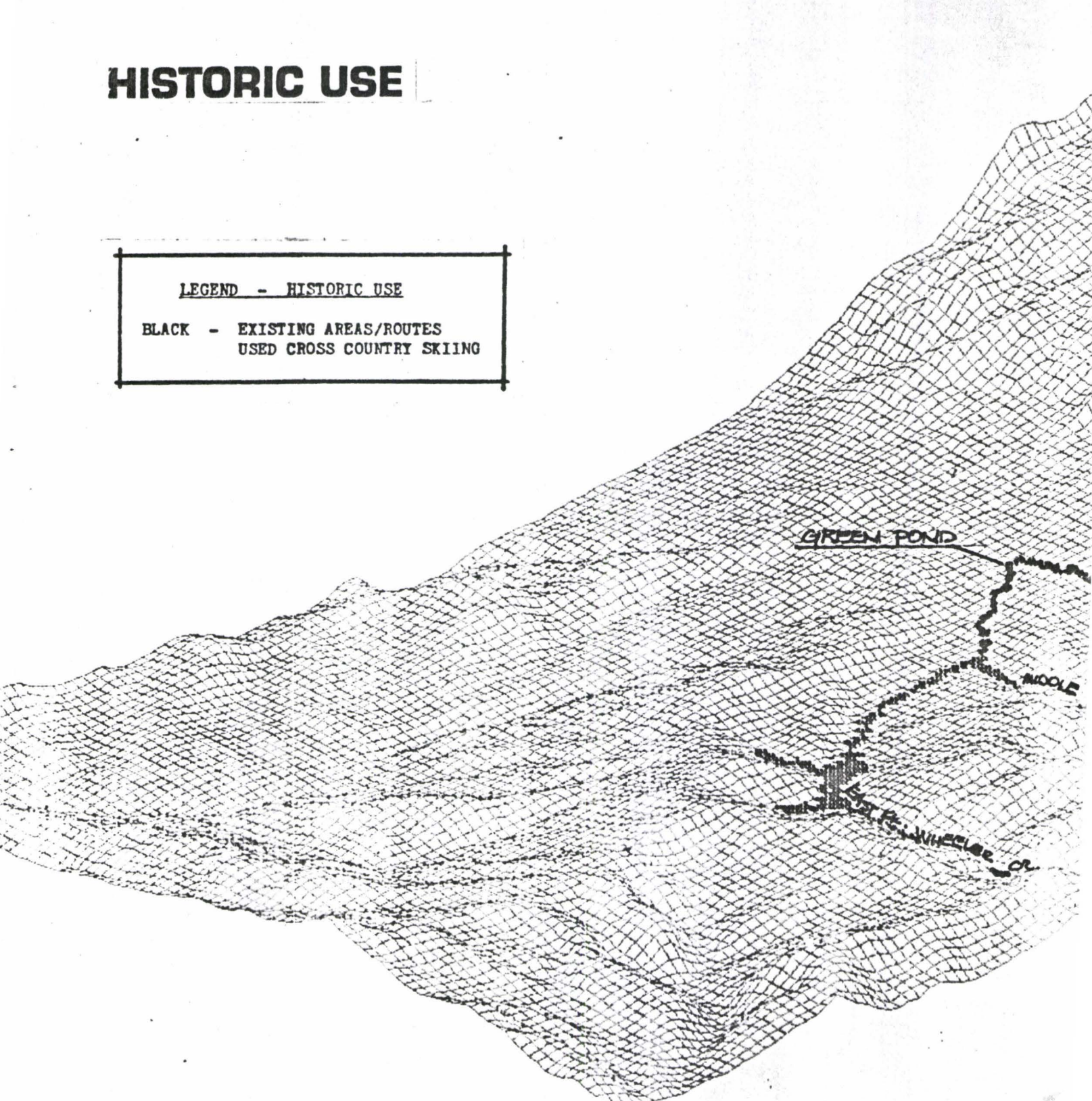


Illustration 5

HISTORIC USE

LEGEND - HISTORIC USE

BLACK - EXISTING AREAS/ROUTES
USED CROSS COUNTRY SKIING



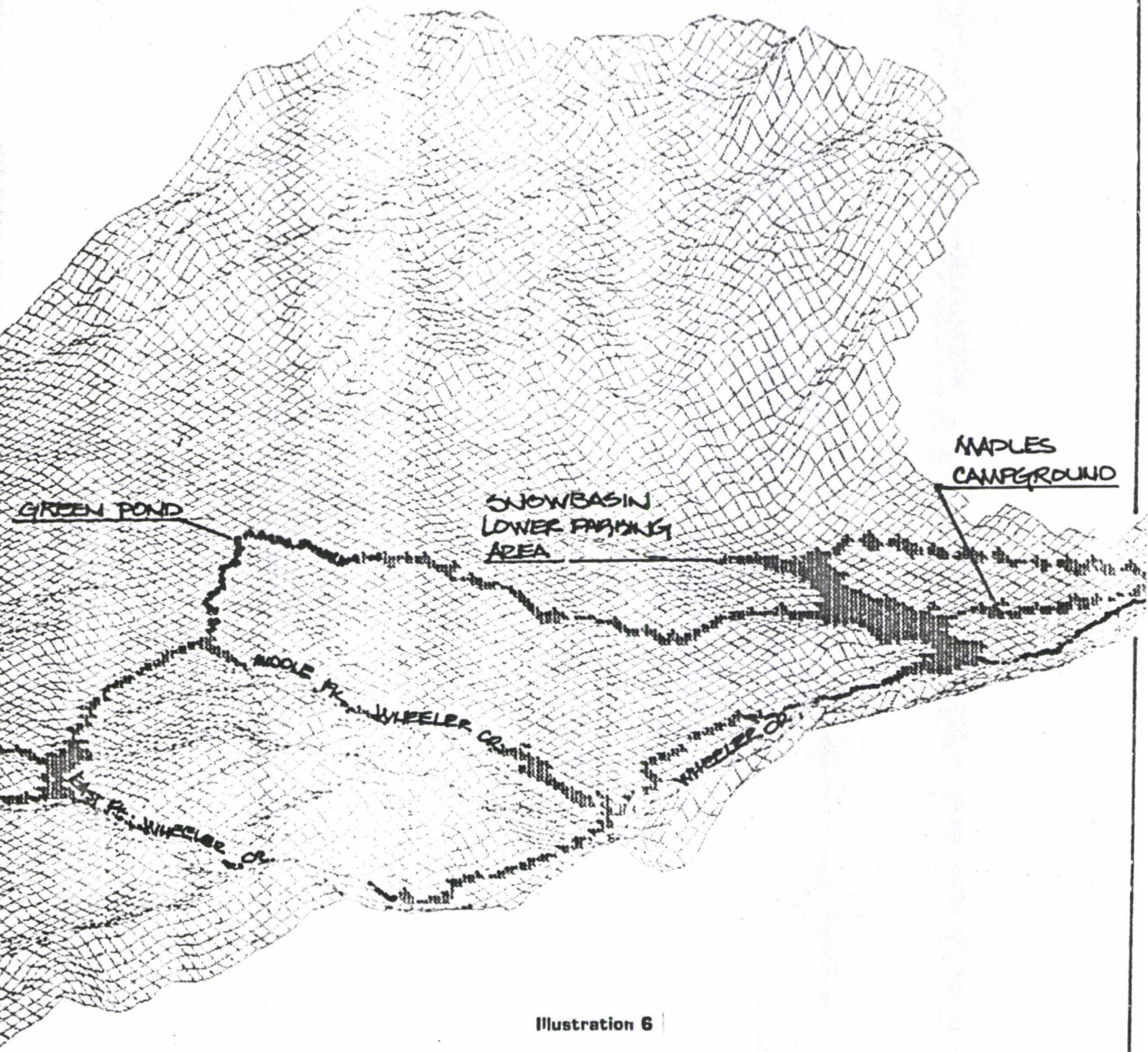


Illustration 6

SKI TERRAIN SUITABILITY

LEGEND - SKI TERRAIN SUITABILITY

WHITE	- UNSUITABLE	LT. GREEN	- GOOD
YELLOW	- POOR	GREEN	- VERY GOOD
ORANGE	- MARGINAL	BLUE	- EXCELLENT
RED	- FAIR	PURPLE	- EXCELLENT

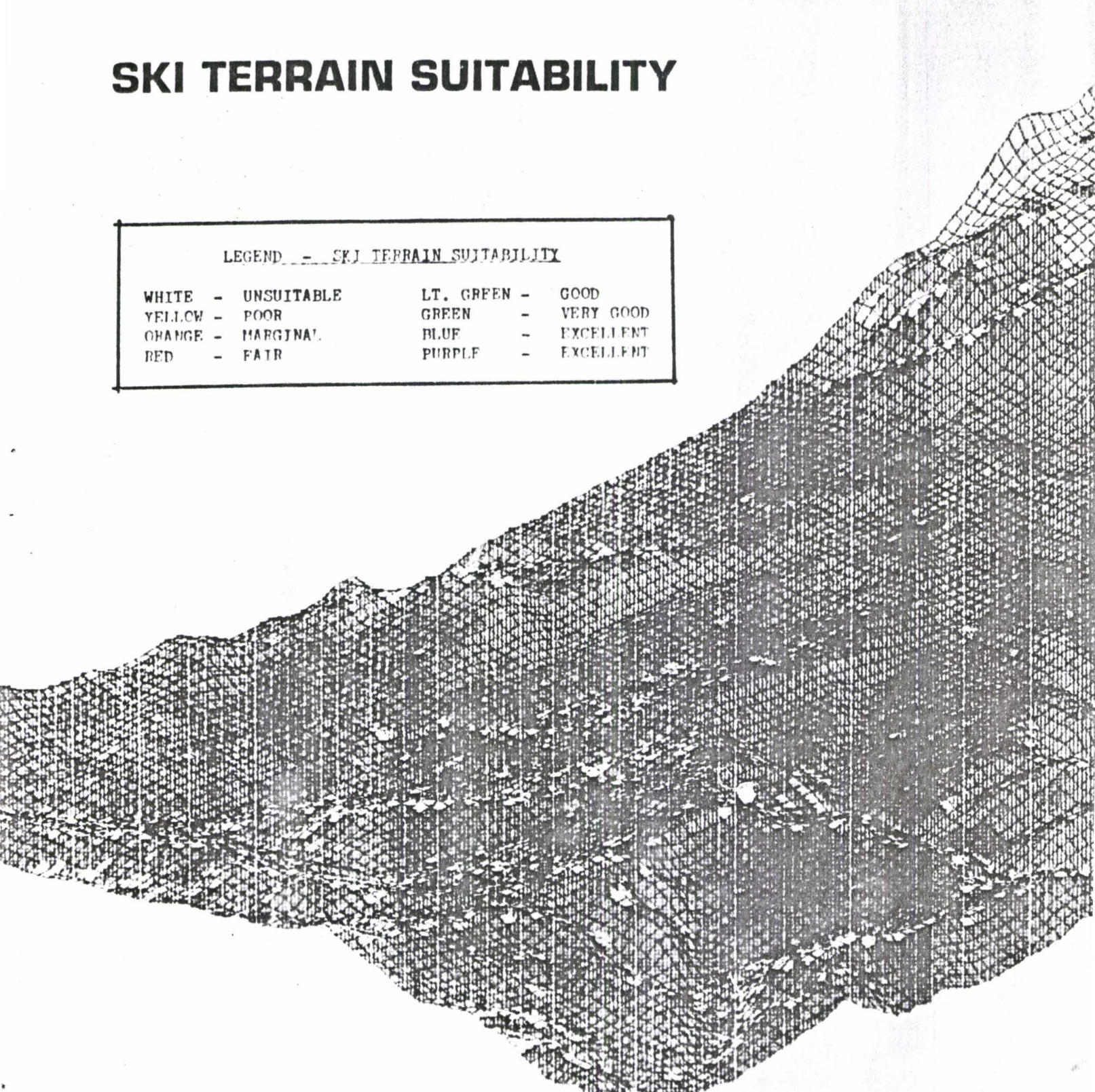


Illustration 7

FUNCTIONAL ANALYSIS

The purpose of the functional analysis is to determine all of the functional components that will be included in the study area and examine conceptually their relationship to one another. Certain functions will need to be grouped, certain functions will need to be separated, certain functions will need road access, etc.

The main functional components to be considered within the study area are: (1) Alpine skiing, (2) the resort development and associated facilities, and (3) cross country skiing, and (4) access and parking. Within the main functional components there are several subcomponents that must be considered:

1. Resort Development
   - A. The resort center which includes the resort hotels, lodges, ski shops, restaurants, lounges, parking, etc.
   - B. The resort housing including condominiums and single family housing.
   - C. The golf course.
   - D. Access and parking to serve these main areas.
2. Cross Country Skiing
   - A. Ski mountaineering.
   - B. Ski touring (off track).
   - C. Telemark skiing.
   - D. Ski touring (set track).
   - E. Ski skating.
   - F. Cross country ski racing.
   - G. Cross country ski touring center.
   - H. Access and parking to serve the areas developed.

FUNCTIONAL RELATIONSHIP

Conceptually all of the resort components, including Alpine skiing, are all interrelated and need to function as a unit. The Alpine Ski Area, the golf course, the resort housing are all related to the resort center. Therefore, these functions need to be located adjacent to one another and linked together since they all contribute to the recreation resort experience. The functional analysis diagram, figure 13, indicates that Alpine skiing, golf, and the resort housing be located adjacent to and linked to the resort center. The resort housing needs to be adjacent to intertwined among the golf course and Alpine Ski Area. The golf course and ski runs can then be utilized as secondary transportation links to tie the whole development together. Main road and secondary road access is needed to provide access for resort users and for service functions. Parking also needs to be provided for day use and overnight resort users, employees, and for service functions.

That part of the cross country skier spectrum oriented towards a social type experience will best fit in this case, as part of the resort. That part of the spectrum that is oriented towards a natural environment needs to be separated and buffered from the resort activities. Therefore, ski touring (set track), ski skating, and ski racing need to be integrated into the resort and function much the same as golf and Alpine skiing. Ski touring (off track) and ski mountaineering need to be separate from the resort. Telemark skiing, since it is so variable, can and should happen in both places (see figure 13).

Ski touring (set track), ski skating, and competitive cross country ski racing all need groomed ski trails with set track in order to function and usually need a cross country ski touring center to adequately provide for the needs of

those skiers. Therefore, a touring center with set track ski trails integrated into the resort will provide for the needs of this portion of the cross country skier spectrum. In order for the touring center to be an asset to the high quality resort planned, a high quality touring center needs to be located in the resort center and be a fully integrated part of the resort. The cross country set track trails need to be high quality and to function much the same as the Alpine ski lifts and ski runs in terms of linking the resort together.

Ski mountaineering and ski touring (off track) need to be functionally separate from the resort since the recreation experience desired has a natural environment solitude orientation. Therefore, access, parking, and trail systems need to be developed in other suitable areas in order to provide opportunities for this part of the skier spectrum.

Telemark skiing can and should happen at both areas. Telemark skiing is becoming more popular at Alpine ski areas including Snowbasin. Opportunities for Telemark skiing within the Alpine Ski Area need to continue. Also, opportunities for Telemark skiing should be made available in suitable areas associated with the set track trail system and the trail system developed for ski touring (off track) (see figure 13).

FUNCTIONAL ANALYSIS DIAGRAM

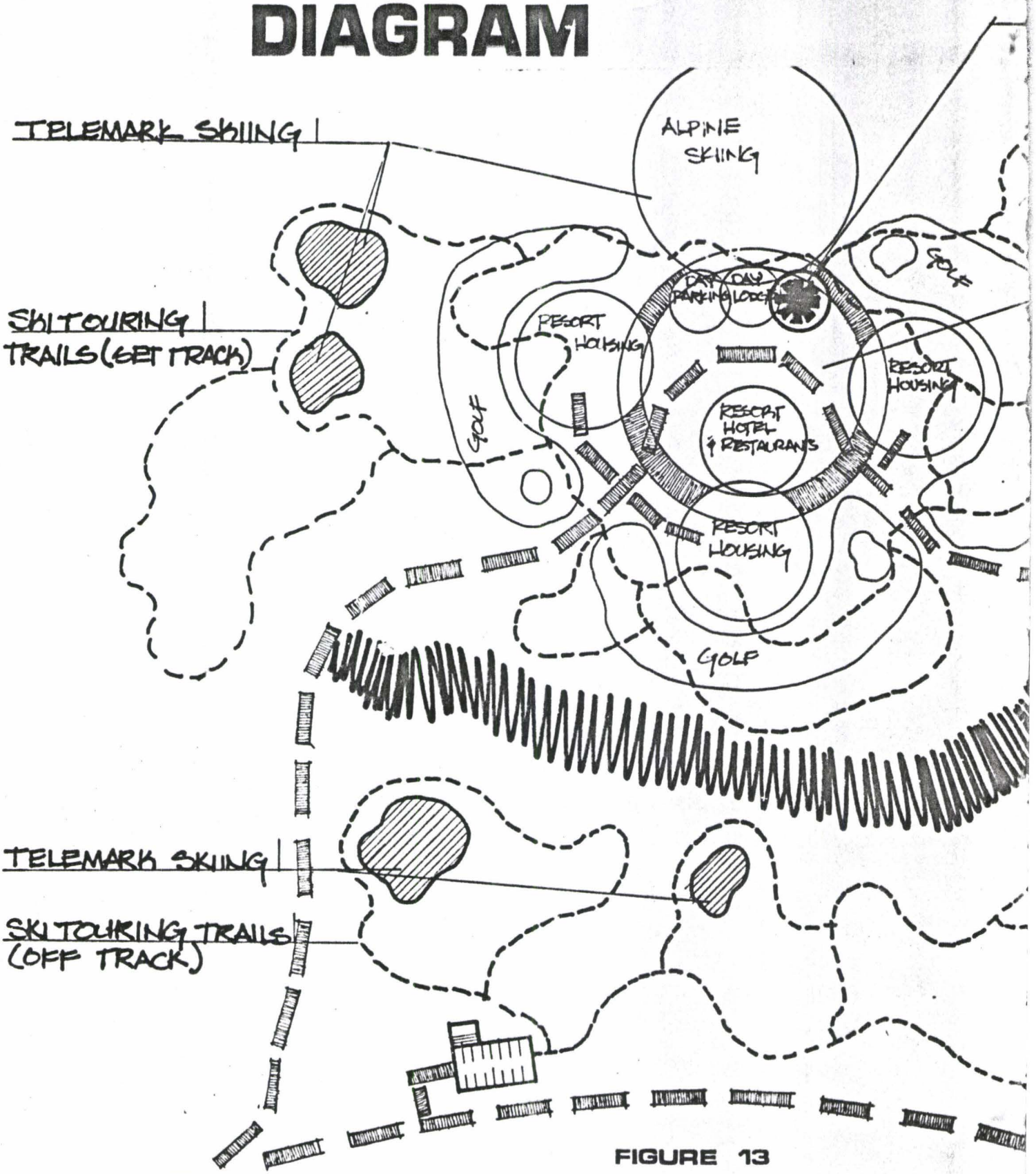
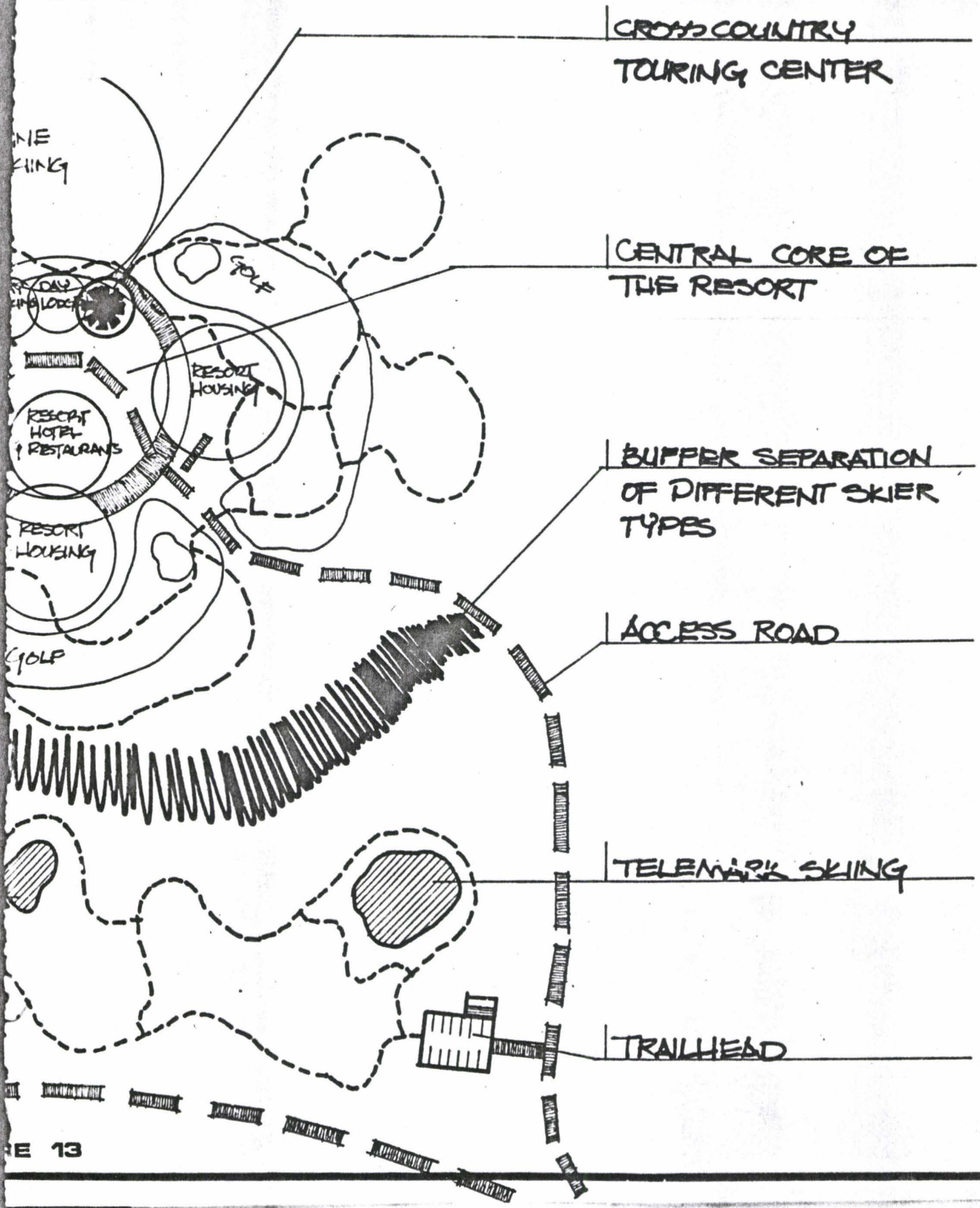


FIGURE 13

YSIS


CROSS COUNTRY
TOURING CENTER
CENTRAL CORE OF
THE RESORT
BUFFER SEPARATION
OF DIFFERENT SKIER
TYPES
ACCESS ROAD
TELEMARK SKIING
TRAILHEAD
GOLF
RESORT
HOUSING
RESORT
HOTEL
& RESTAURANTS
RESORT
HOUSING
GOLF

ROLES OF THE FOREST SERVICE AND SUN VALLEY COMPANY PROVIDING CROSS COUNTRY SKIING

One of the secondary purposes of this study is to define the roles of the Forest Service and Sun Valley Company in providing cross country skiing opportunities. Based on the functional analysis the obvious division in roles is as follows:

SUN VALLEY COMPANY	FOREST SERVICE
Provide <u>opportunities</u> for the more social end of the cross country skier spectrum: Ski touring (set track) Ski skating Cross country ski racing Telemark skiing at the Alpine Ski Area and associated with the set track ski trail system.	Provide <u>opportunities</u> for the cross country skier spectrum oriented towards experiencing the natural environment: Ski touring (off track) Telemark skiing associated with the trail system developed for ski touring (off track).
Provide <u>facilities/services</u> to meet the needs of those skier types: Access, parking & sanitation Cross country ski touring center Cross country ski lessons & ski rental Food service & overnight accom. Groomed set track ski trail system with ski skating lanes	Provide <u>facilities</u> necessary to meet the needs of these skier types: Access, parking & sanitation Trail system for ski touring (off track)

SNOWBASIN CROSS COUNTRY SKI MASTER PLAN

The master plan is the fourth and final step in the planning process. The information gathered to this point was combined to form the plan delineated on Map D (found at the back of the report). The overall objective of the plan is

to provide cross country skiing opportunities for as much of the cross country skier spectrum as possible.

HIGHLIGHTS OF THE PLAN

The plan contains opportunities for ski touring (off track), Telemark skiing, ski touring (set track), ski skating, and competitive ski racing. A total of 97.5 kilometers of ski trail are planned, 38.5K of which are set tracks trails and 48K are ungroomed. Skating lanes would be provided on eight kilometers of the set track trail system. A cross country touring center is to be developed at the resort and would include ski rental, ski lessons, retail sales, and possibly guided tours. Telemark skiing areas are planned on both of the trail systems (set track and ungroomed). There are no opportunities within the study area that are suitable for ski mountaineering.

GROOMED SKI TRAILS

The groomed ski trails provided by the resort total 38.5 kilometers. The proposed set track system would provide opportunities for ski touring (set track), ski skating, and cross country ski racing. The trail system was developed using the ski terrain suitability map and the proposed resort master plan. The trail system was located in the good, very good, and excellent suitability areas with some minor exceptions. The trail system was developed to minimize conflicts with the resort plan and help link the resort together. Also, minimizing earth work and grading to provide the trails was a major consideration. Once the trail system was planned the slope map was used to check the trail gradient and to classify the trails as easiest, more difficult, and most difficult. The following table is a summary of the groomed trail system.

Groomed Ski Trail Summary

TYPE	DIFFICULTY LEVEL	DISTANCE	% OF TOTAL	SUGGESTED TRAIL FEES
Set Track	Easiest	8 K	21%	$5/$9 for
	More difficult	26 K	67.5%	A full day
	Most difficult	4.5 K	11.5%	$3.50/$6.50 half day
Ski Skating1/		8 K	21%	Same

TABLE 11

1/ Ski skating lanes would be provided on the set track trails identified as easiest because of a 12% slope limitation. Other parts of the trail system need to be studied in more detail to determine if additional skating lanes are feasible.

The set track trails were planned to be double track (two sets of track side by side). The trails indicated as two way trails are planned to have a double track set in both directions. The trails indicated for ski skating would have a groomed skating lane in each direction. Trail widths would be guided by the criteria in figure 12, chapter II.

The trail system would be accessed at two locations. One at the touring center and one at the parking area adjacent to ski lift #12.

CROSS COUNTRY SKI TOURING CENTER

A cross country ski touring center is planned at the resort center near the day lodge and day skier parking area. This location was chosen for two reasons: (1) To take advantage of the services available at the resort center, including food service and overnight accommodations, and (2) if the center is to be a

success, it needs to be centrally located, easy to find, and convenient for the user. Based on the research done in this study the following are suggested services the touring center should offer:

SKI RENTAL

Type of Equipment	No. of Skis/Poles	No of Boots	Price Full Day	Price Half Day
Waxless touring equip.	75-100 pr.	100-125 pr.	$8/10	$6/$7
Telemark equipment	25-30 pr.	30-35 pr.	$12/$14	$8/$10
Ski skating & ski racing equip.	25-30 pr.	30-35 pr.	$12/$14	$8/$10

TABLE 12

SKI LESSONS

Type of Lessons	Fees	Length
Group lessons:beginner, intermediate & expert	$11-$14 (including daily track fee)	Two hours
Telemark lessons	$15-$20 (given in the Alpine area & does not include ski lift pass)	Two hours
Private lessons	$20-$25 $10	First hour Every additional hour

TABLE 13

SKI PATROL

A ski patrol should be provided for user safety, to control use on the trail system, and to provide first aid to injured skiers. The patrol could be all paid personnel, all volunteer, or combinations of both. It is suggested that there would be one patrolman per 10K of track on weekdays and two patrolmen per 10 K track on weekends and holidays. That translates into three to four patrolmen on duty during the week and six to eight on weekends and holidays.

GUIDED TOURS

Day and overnight guided ski tours could be developed and marketed by the touring center. The following are potential areas where tours could be developed:

1. Strawberry, Demoisey, and Mount Ogden Peaks along the Wasatch Front.
2. Coldwater and Lewis Peaks west of Pineview Reservoir.
3. Ben Lomond/Willard Peak area north and west of Pineview Reservoir.
4. Wheatgrass Canyon/Lightning Ridge/Baldy Ridge area east of Causey Reservoir.
5. Moon light tours on the Snowbasin ski trail system.

RETAIL SALES

The touring center should provide sales of miscellaneous accessories such as hats, gloves, clothing items, ski wax, etc. The touring center could also sell various types of cross country skis and equipment, if feasible.

FOOD SERVICE/OVERNIGHT ACCOMMODATIONS

Food service and overnight accommodations are planned as part of the resort and should be reasonably close to the cross country touring center.

SKI TOURING (OFF TRACK) TRAIL SYSTEM

The ski trail system, planned to provide opportunities for ski touring (off track) type skiers, totals 49 kilometers. This trail system and associated facilities would be provided by the Forest Service. This trail system again was developed using the ski terrain suitability model. The suitability

categories of good, very good, and excellent were used for the most part, however, the fair category was used to develop portions of the system. These areas in the fair category will have to be field checked to determine feasibility. Once the trail system was delineated it was checked using the slope map and classified as to difficulty level 1/. The trails are planned to accommodate two skiers side by side and will follow the guidelines in Table 2, Chapter II. The following is a summary of the ski touring (off track) trail system.

1/ The difficulty level categories were determined based on the guidelines in Table 1, Chapter II.

SKI TOURING (OFF TRACK) SKI TRAIL SUMMARY

Difficulty Level	Length (Kilometers)	% of Total Length
Easiest	15.8 K	32.2%
More difficult	26.7 K	54.5%
Most difficult	6.5 K	13.3%

TABLE 14

ACCESS & PARKING

Access to the trail system is from State Highway 226 and the Trappers Loop highway. Three trailheads are planned to provide parking and sanitation facilities. The facilities planned at these trailheads are as follows:

PLANNED TRAILHEAD FACILITIES

Trailhead Name	Amount of Parking	Person At One Time Capacity	Sanitary Facility 3/
East Fork	50 cars	150	1-4 unit vault toilet
Dry Creek	100 cars	300	1-6 unit vault toilet
Hawkins Creek	20 cars	60	1-2 unit vault toilet

TABLE 15

3/ The size of the sanitary facilities were determined using the Weber County Campground Ordinance and Forest Service Manual 2330.

BUFFER AREA

The Trappers Loop Highway, the proposed Snowbasin Ski Area access road, and the Middle Fork of Wheeler Creek were used to separate and buffer the set track resort type users and the ski touring (off track) type users. The area west of the Trappers Loop Highway, south of the proposed Snowbasin access road, and west of the Middle Fork of Wheeler Creek was utilized for the resort set track users and the remaining area was used for the ski touring (off track) types users.

DEVELOPMENT PHASES

The ski touring (off track) area was divided into three geographic units: (1) East Fork Wheeler Creek, (2) Dry Creek, and (3) Hawkins Creek. These geographic areas correspond to three phases of development as follows:

DEVELOPMENT PHASES - SKI TOURING (OFF TRACK)

Phase	Area Name	Trail Length Easiest	More Difficult	Most Difficult	Trailhead Development
1.	East Fk. Wheeler Cr.	9.3 K	9.8 K	4.5 K	East Fork Trailhead
2.	Dry Creek	6.6 K	6.4 K	0	Dry Creek Trailhead
3.	Hawkins Cr.	0	10.5 K	2.0 K	Hawkins Creek Trailhead

TABLE 16

TELEMARK SKIING

Telemark skiing is highly variable and takes place all across the cross country skier opportunity spectrum; therefore, opportunities for Telemark skiing were planned in several areas each offering a different type experience. Telemark skiing was planned in the following areas:

1. Telemark skiing is popular at Alpine ski areas including Snowbasin. Opportunities for that type Telemark skiing will continue.
2. A Telemark teaching area has been established in conjunction with ski lift #10.
3. A Telemark area is planned in conjunction with the set track trail system just south of ski lift #11. Telemark ski runs will be developed in this area.
4. Four areas are planned in the East Fork Wheeler Creek area associated with the ski touring (off track) trail system. Telemark ski runs are planned in these areas.

SKI MOUNTAINEERING

There are no suitable areas for ski mountaineering within the study area. There are, however, several areas outside the study within close proximity (less than 20 miles away) that are currently being used or have potential for that type use. There are also many more potential areas within 2 - 3 hours driving time from the study area. These areas are mentioned under the Guided Tours section of this chapter and will need further study to determine feasibility.

CHAPTER IV

IMPLEMENTATION & FURTHER STUDY

This chapter of the study outlines several steps to be completed in order to implement the master plan. These steps include: (1) Presentation of the study and neogtiations with Sun Valley Company, (2) Forest Service procedural steps, and (3) items that need additional or detailed study.

SUN VALLEY COMPANY

This study will be presented to Sun Valley Company and their planners in order to gain support for the master plan and to fully integrate the cross country ski plan into the resort master plan. Negotiations will take place with the Sun Valley Company on the following items:

1. Recommended changes in the resort master plan to better facilitate cross country skiing.
2. Phasing and timing of the cross country facilities and trail system.
3. Obtaining Forest Service rights-of-way or easements on Sun Valley Company lands for the trail system and facilities that the Forest Service would develop.

FOREST SERVICE PROCEDURAL STEPS

The following procedural steps need to be completed in order to implement the Forest Service portion of the master plan.

1. The Wasatch-Cache National Forest Land Management Plan will need to be amended to include the proposed trail system, the addition of three trailheads, and the needed rights-of-way.

2. Cost estimates are needed for the trail system and trailheads facilities and then the costs programmed into the budget process.

3. A significant portion of the facilities and trail system the Forest Service would provide are located on private land. Rights-of-way or easements are needed in the following areas prior to implementation:
   - A small portion of the trail system in the East Fork area is on private land.
   - The Dry Creek area trail system and trailhead are entirely on Sun Valley Company land.
   - The Hawkins Creek trail system and trailhead are located on Sun Valley Company land and other private land.

4. Ensure that the set track trails are layed out and are fully integrated into the destination skier resort facilities being planned by Sun Valley Company.

FURTHER STUDY

Additional or more detailed study is needed for the following in order to implement the master plan:

1. This study does not include any information on planned densities of skiers on the various ski trails. Planned densities of skiers using the trail systems would provide more specific data to guide planning of trailhead parking, sanitation, and expansion of the trail system.
2. Detailed designs for trailheads and sanitary facilities are needed.
3. Detailed planning (i.e., longitudinal profiles, trail widths, proposed signing, etc.) and field checking of the trail system is needed.
4. A study is needed on adjacent areas to determine feasibility of providing ski mountaineering opportunities.

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